

Panasonic Services Company

9TH Gen. Plasma Display Television



National Training

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Models Comparison

Comparison Table					
MODEL	Resolution	SD Card	TV-Guide EPG	CableCARD slot in the Tuner	PC Input
TH-65PX600U	1920x1080p	Yes	Yes	Yes	Yes
TH-58PX600U	1366x768p	Yes	Yes	Yes	Yes
TH-50PX600U	1366x768p	Yes	Yes	Yes	Yes
TH-42PX600U	1024x768p	Yes	Yes	Yes	Yes
TH-58PX60U	1366x768p	Yes	No	No	No
TH-50PX60U	1366x768p	Yes	No	No	No
TH-42PX60U	1024x768p	Yes	No	No	No
TH-37PX60U	1024x720p	Yes	No	No	No
TH-42PD60U	852x480p	No	No	No	No
TH-50PX6U	1366x768p	No	No	No	No
TH-42PX6U	1024x768p	No	No	No	No

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This table is a comparison between the different models of this line of plasma televisions.

Beside having all the features found on the PX60U models, the PX600U models have some unique features like TV Guide EPG, CableCARD Slot, and PC Input.

Only the 65PX600 has 1080p resolution. All other 2006 models will take a 1080p input but display it in their native resolution.

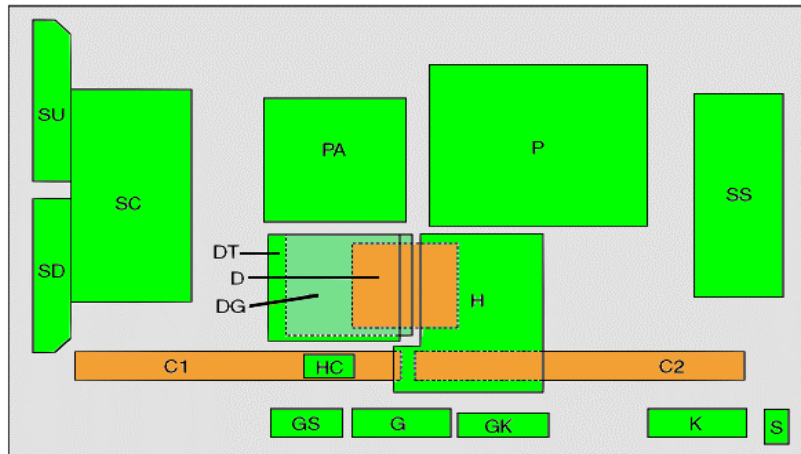
Input/Output (Jacks)

	TH-42/50/58/65 PX600U	TH- 37/42/50/58PX60U	TH-42PD60U
INPUT/OUTPUT:			
Tuners	NTSC (Standard analog broadcasts) ATSC/QAM (SDTV and HDTV broadcasts)	NTSC (Standard analog broadcasts) ATSC/QAM (SDTV and HDTV broadcasts)	NTSC (Standard analog broadcasts) ATSC/QAM (SDTV)
Photo Viewer	Yes (SD Slot)	Yes (SD Slot)	No
SD Card Slot	Yes (JPEG Photo Viewer)	Yes (JPEG Photo Viewer)	No
CableCARD Ready ⁵	Yes	No	No
HDMI-HDCP Interface	2 rear	2 rear	1 rear
Analog Audio Input (for HDMI)	1 rear	1 rear	1 rear
Composite Video Input	3 (2 rear, 1 front)	3 (2 rear, 1 front)	2 rear
S-Video Input	3 (2 rear, 1 front)	3 (2 rear, 1 front)	2 rear
Audio Input (for Video)	3 (2 rear, 1 front)	3 (2 rear, 1 front)	2 rear
PC Input (RGB-VGA)	Yes	No	No
Audio Input (for PC)	Yes	No	No
Component Video Input [Y, PB(CB), PR(CR)]	2 rear	2 rear	2 rear
Audio Input (for Component Video)	2 rear	2 rear	2 rear
Composite Video Output	1 rear	1 rear	1 rear
Audio Output	1 rear	1 rear	1 rear

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This table shows the input signals available for each line of plasma TV.

42PX60 Board Layout



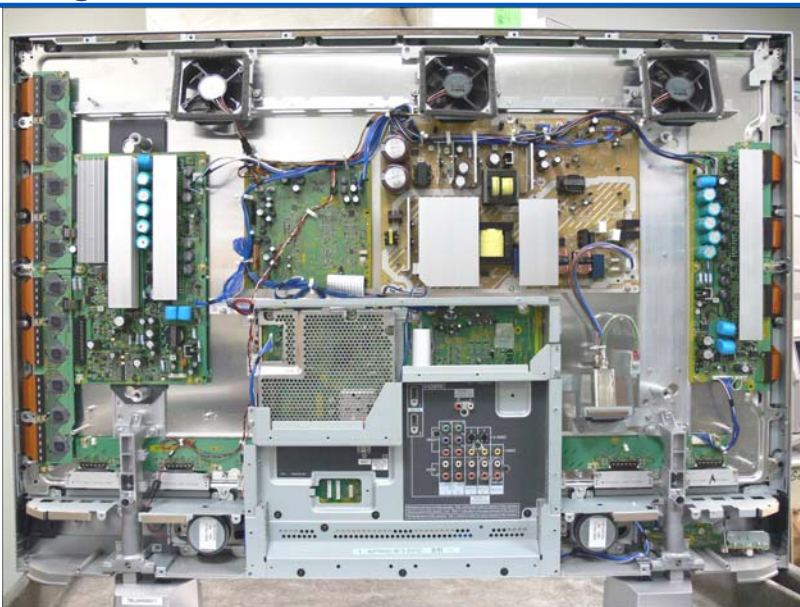
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42PX60 Board Description

Board Name	Function	Board Name	Function
P	Power Supply	SC	Scan Drive
PA	DC-DC Converter, Speaker out, Audio AMP, Fan Control	SU	Scan out (Upper)
		SD	Scan out (Lower)
H	AV Terminal, AV Switch	SS	Sustain Drive
DG	Digital Signal Processor, Micom, HDMI Interface	K	Remote receiver, Power LED
DT	ATSC Interface	S	Power Switch
D	Format Converter, Plasma AI, Sub-Field Processor	G	Front Terminal
HC	Jig Connection	GS	SD Card Slot
C1	Data Driver (Lower Right)	GK	Key Switch
C2	Data Driver (Lower Left)		

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Getting Familiar With The New Plasma TV



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Before this generation of plasma TV, Panasonic has always used the double scan system in their HD plasma TV. In this generation, the 37" and the 42" HD models utilized the single scan system.

The earlier production of HD 42" models have 3 fans and the HD 50" models contain 4 fans. Normally there will only be 2 fans in the HD 42" models and 3 fans in the HD 50" models.

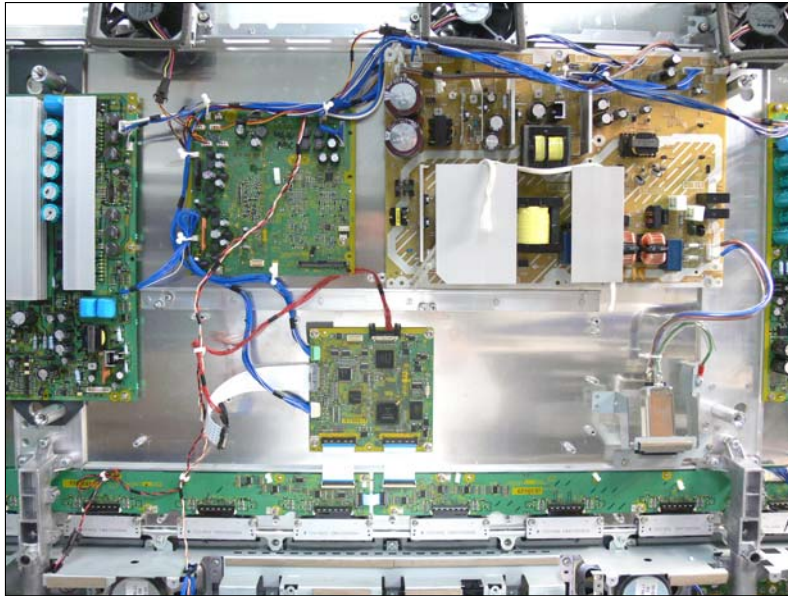
Differences Between 8th and 9th Generations

1. No Data Drive Circuit Boards (C Boards) for 37" and 42" models (PD60U, PX6U, PX60U, & PX600U) at the top of the TV.
2. The PA board is back where it originally was in the 6th Generation models.
3. No PB board (Fan Drive and Audio +B)
4. No Z board (Audio Amp.)
5. The D board is now hidden under the DG board.
6. No DV board
7. Different Digital Tuner (Optical Jack is on the right)
8. The SD and SU boards are flipped, showing the component side.

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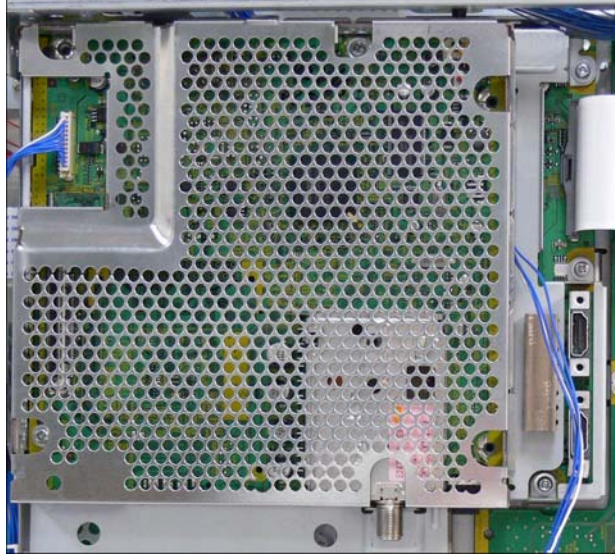
The differences between the 8th and the 9th generation are explained here.

D board Location



The purpose of this picture is to show the new location of the D board, which seats below the DG and the DT boards. Unlike the previous generation, there's not any access to this board.

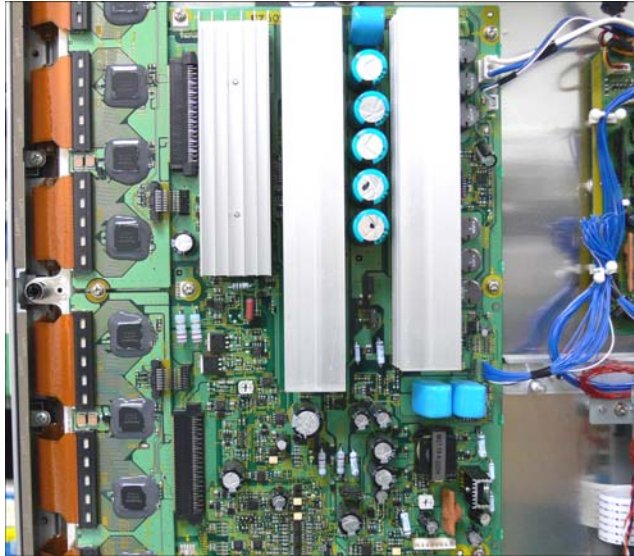
Digital Tuner/HDMI Connector



When an ATSC channel is selected, the output of the DIGITAL AUDIO OUT jack is Dolby Digital. When a NTSC channel is selected, the output is PCM.

Since the TV does not have a DV board, this picture shows the new location of the HDMI connectors (2). These connectors are located on the DG board. The previous models only had 1 HDMI connector.

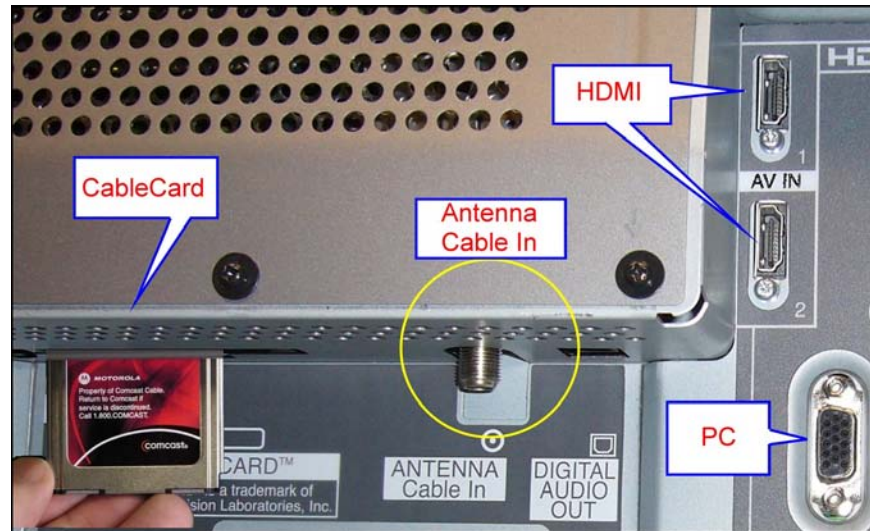
SC, SU, and SD Boards



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The component side of the SU and SD boards is now visible without removal.

Inputs



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This picture shows the CableCARD slot, the Antenna terminal, the HDMI input connectors, and the PC input connector.

HDAVI

HDAVI control

Enables unified control between compatible Panasonic products connected via the HDMI cable, so you can, for instance, control multiple compatible Panasonic A/V products from a single remote.

The new EZ-Sync

This might look like just another so-called universal remote. But universal remotes are really not 'universal' at all. What they do is combine a bunch of incompatible controllers into one case. Playing a DVD with a DTS soundtrack with a universal remote requires pushing just as many buttons as using three separate remotes.

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"With EZ-Sync, you press one button and

- The TV turns on
- The DVD player turns on
- The home theater surround sound system turns on and automatically selects the right inputs and settings to use for the DVD."

Control with HDMI “HDAVI Control”

Home theater's Remote Control



- Connect the Compatible Home Theater (SA-HT940) using the HDMI connector.
- Turn on the HT and the TV individually to first establish communication.
- If there is a disc in the unit and the “Active Theater” button on the HT is pressed, the HT turns on, it starts to play the disc, and the TV turns on with HDMI input selected.

In the OI, they refer to the “Active Theater” button as the “One Touch Play” button.

Control with HDMI “HDAVI Control”



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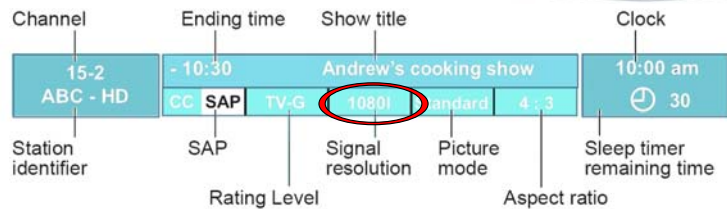
Under normal condition, the menu does not show the “Home Theater” option. This option is added to the menu when the TV is connected to a HDAVI compatible Panasonic home theater unit.

This feature allows you to control the home theater’s volume by using the TV’s remote control.

How Do I know the Format of the Signal Received?



Press the “Recall” button on the Remote Control



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In previous models, information that could only be seen in the serviceman mode menu is now available by pressing the “RECALL” button on the remote control.

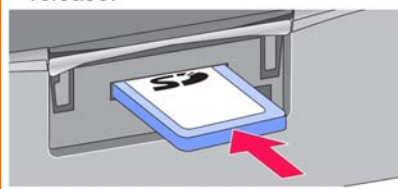
SD Card (PX60U & PX600U)

● Insert the card



Remove the card

➡ Press in lightly on SD Card, then release.



Compliant card type

(maximum capacity)

- SD Card (2 GB)
- Mini SD Card (1 GB)
(requiring mini SD Card adapter)



Recycle the Power if the TV won't read the card

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The PX60U and the PX600U models are equipped with a SD card slot for photo viewing purposes. The maximum card capacity is now 2GB for SD card and 1 GB for mini SD card. The mini SD card requires a SD card adapter.

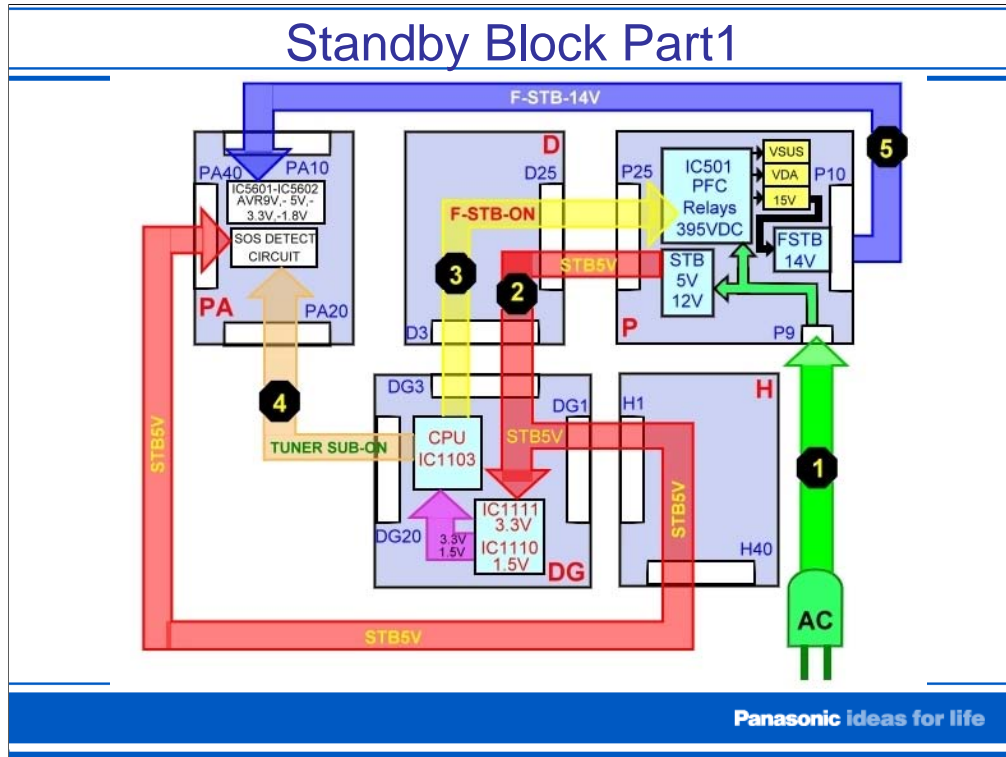
The SD card slot on the PX600U models has a light that turns on when a card is inserted. The menu provides option to turn this feature off or on.

Note: Firmware upgrade can also be done through the SD card slot.

Power Supply

Power Supply

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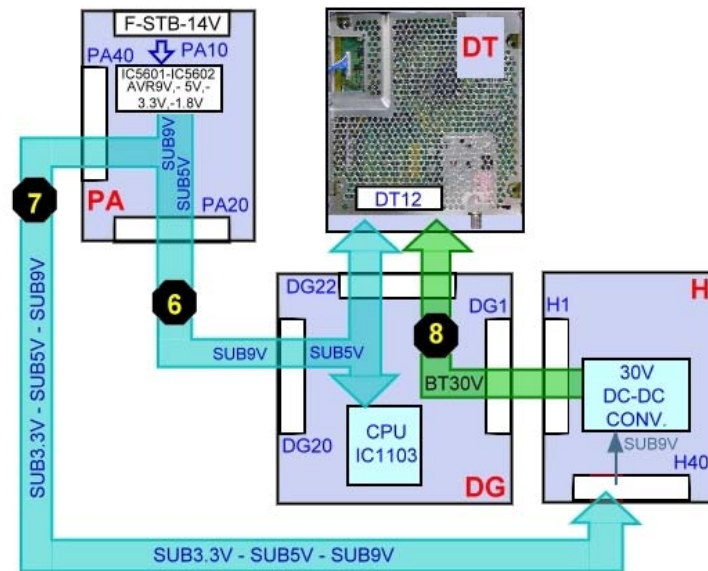


This block diagram shows the sequence of events that takes place inside the TV during standby.

When the TV is plugged in:

1. AC is applied to the power supply board (P) through connector P9. The AC is applied to the standby circuit to produce STB12V and STB5V. The STB12V is only used to turn on a circuit whose function is to allow the output of the STB5V through connector P25.
2. The STB5V passes through the D board via the connectors D25 and D3 and enters the DG, the H, and the PA boards. The STB5V is applied to a 3.3V and a 1.5V regulator circuit to power the Main CPU (IC1103) on the DG board.
3. When IC1103 receives 3.3V and 1.5V, it outputs a command that is provided to both the P and the PA board. This command only lasts approximately 15 seconds. The command applied to the P board is called "F-STB-ON" and it is routed through the D board via connectors D3 and D5. The function of this command is to turn on the circuit that generates the "F-STB-14V" in the P board.
4. The command applied to the PA board through connector PA20 is called "TUNER-SUB-ON". The function of this command along with the STB5V from connector PA40, is activate the "SOS DETECT" circuit in the PA board.
5. The F-STB14V from connector P10 on the P board is applied to the PA board through connector PA10. This voltage is applied to a regulator circuit that generates: SUB9V, SUB5V, and SUB3.V.

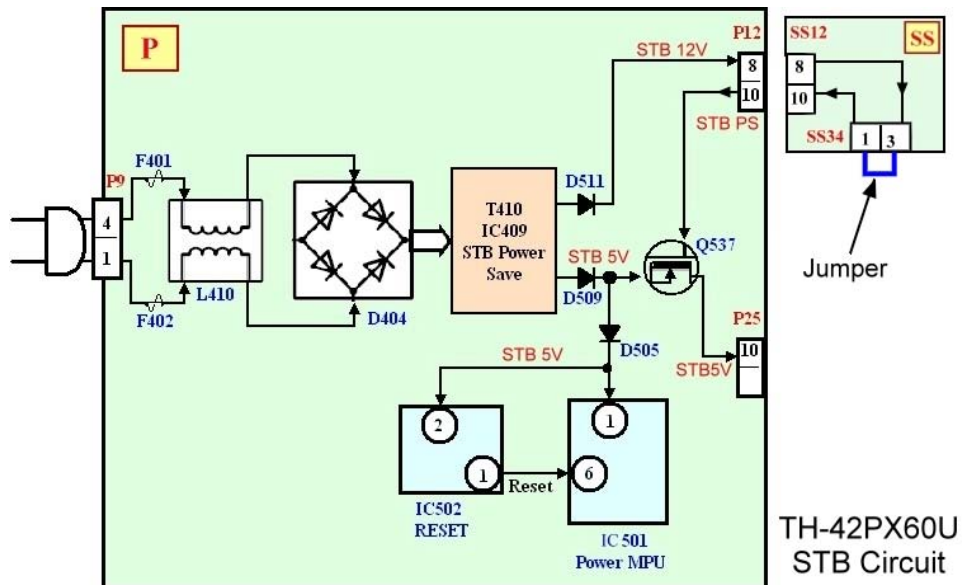
Standby Block Part 2



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6. The STB9V and STB5V from the PA board are provided to the Main CPU IC1103 on the DG board as 9V detect and 5V detect lines. If any of these voltages is missing, the TV goes into shutdown and the power LED blinks 10 times as soon as the unit is plugged into the wall outlet. The STB9V and the STB5V are also applied to the DT.
7. The H board also receives STB9V and STB5V with the addition of the SUB3.3V. The SUB9V is applied to a DC-DC converter to generate the BT30V.
8. The BT30V is connected to the DT board via the DG board through connectors DG1 and DG22.

Power Supply (Standby Circuit)



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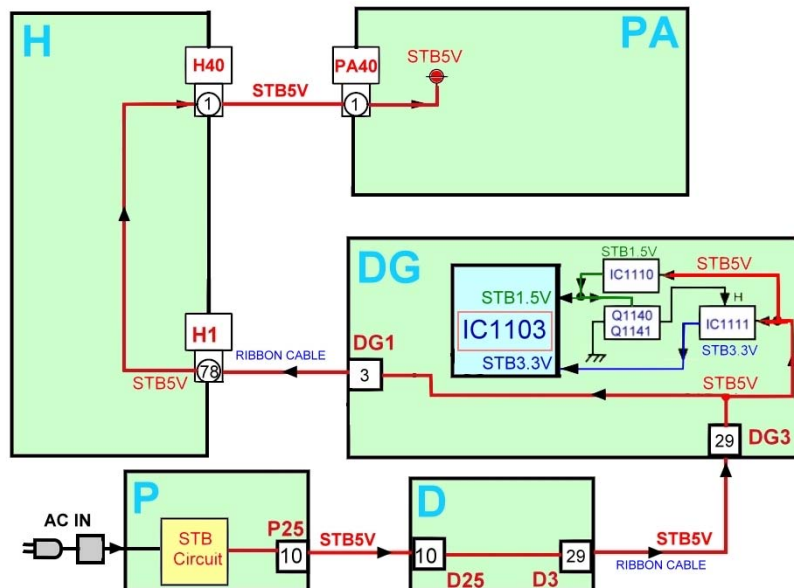
This is a sequence of events that take place during the standby operation.

The AC from connector P9 is filtered by the line filter L410 and then it is rectified by the bridge rectifier D404. The DC from D404 is applied to the standby circuit (T410, IC409) where 12V and 5V are developed.

The STB5V is applied to pin 1 of the Power MPU IC IC501 and pin 2 of the Reset IC, IC502.

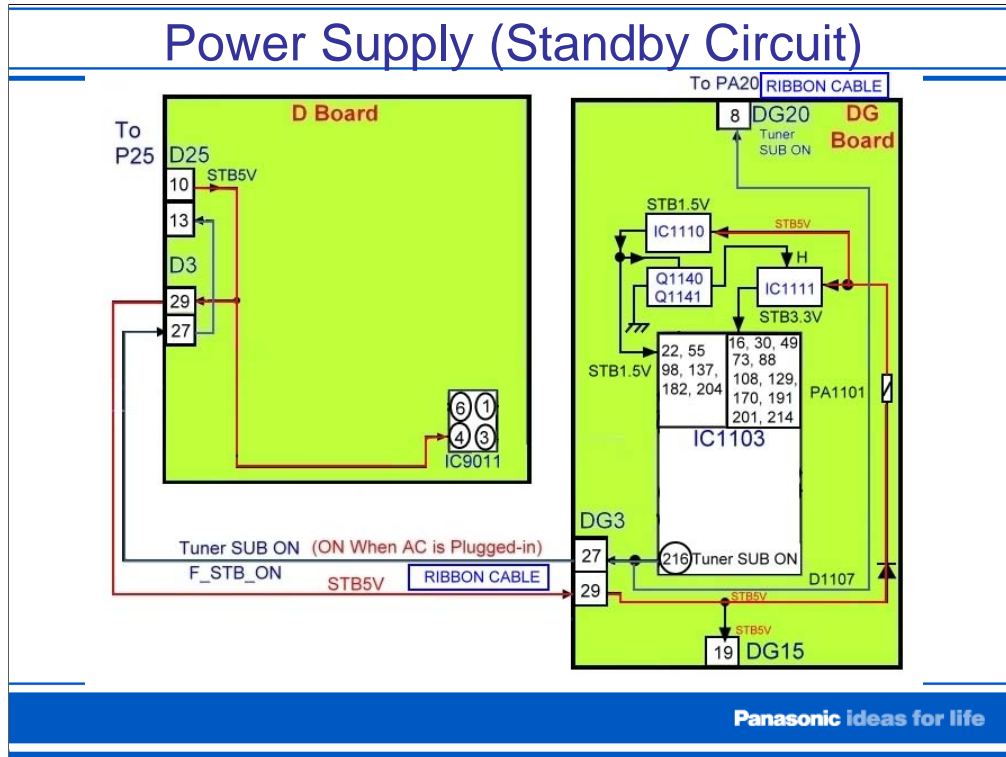
The STB5V is also applied to the source of Q537 and the STB12V is applied to the gate of the transistor to turn it on. As a result, the STB5V comes out on pin 10 of connector P25.

STB5V Distribution



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The STB5V is routed through the D board to be connected to the DG board. In the DG board, the STB5V is used to generate the 1.5V and the 3.3V to power the CPU (IC1103). The STB5V is also routed through the H board and applied to the PA SOS detect circuit. The explanation for the circuit that generates the STB3.3V and STB1.5V is covered in the next slide.



The STB5V from the P board is connected to the D board via connector D25. From there, it is provided to the DG board via pin 29 of connector DG3.

On the DG board, the STB5V is connected to a 3.3V regulator, and a 1.5V regulator.

IC1110 provides the STB1.5V to the CPU IC1103 and the switching circuit consisting of Q1140 and Q1141. The switching circuit outputs a high to turn on the STB3.3V regulator (IC1111).

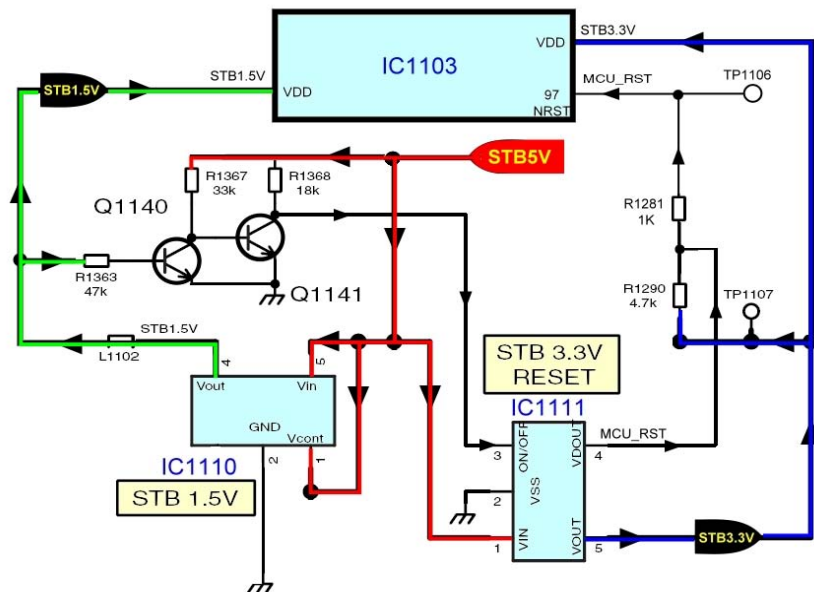
The 3.3V from IC1111 is provided to the CPU IC1103.

When IC1103 receives both 1.5V and 3.3V, it sends out a 3.2V command out of pin 216.

This command is provided to two different circuits and is given a different name in each of these circuits. It first goes to pin 8 of connector DG20 under the name of “Tuner-Sub-ON” and from there it goes to connector PA20 on the PA board to activate the protection circuit of the PA board.

This command also goes to pin 27 of connector DG3 under the name of “F-STB-14V ON”. From there it goes to pin 13 of connector D25/P25 of the power supply circuit (P board).

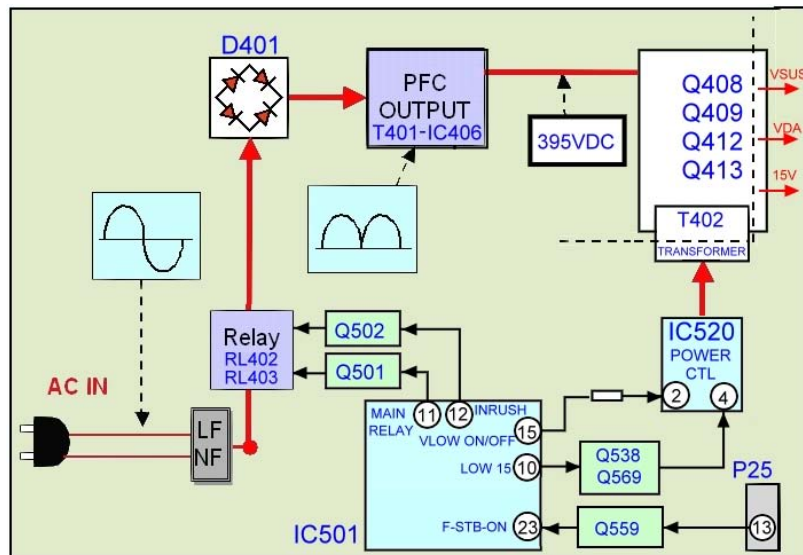
STB5V, STB3.3V, and STB1.5V



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This is a schematic diagram of the STB3.3V, and STB1.5V regulators. To understand the operation of the circuit, see the explanation of the previous slide.

F-STB-ON (Primary)

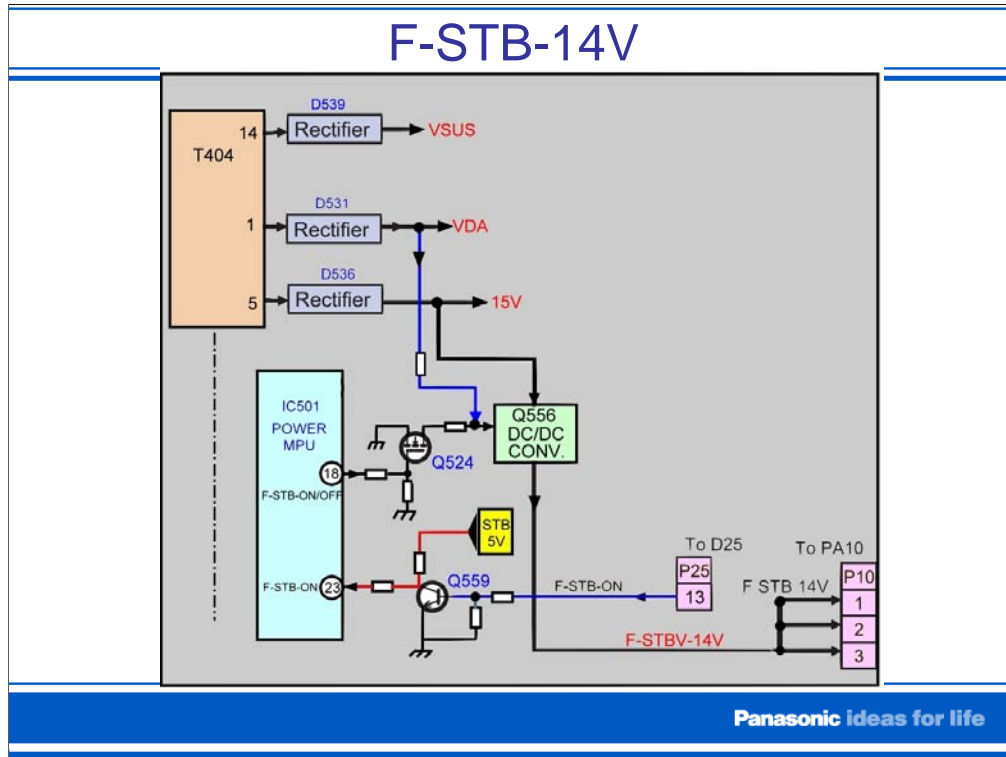


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The F-STB-ON voltage (3.2) from pin 13 of connector P25 is applied to pin 23 of the Power CPU (IC501) on the P board.

IC501 sends out commands to first turn on the primary circuit of the power supply, and then the circuit that allows the FSTB14V to develop on the secondary circuit.

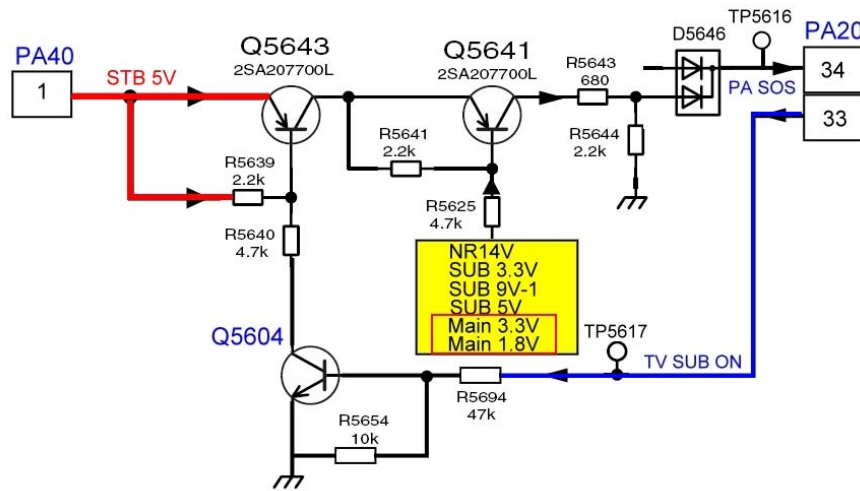
1. The relay commands (high) from pins 11 and 12 of IC501 are used to trigger the relays RL402 and RL403. The incoming AC passes through the relays and enters the bridge rectifier D401. The DC voltage from D401 is applied to the Power Factor Control (PFC) circuit (T401 and IC406). The PFC outputs 395VDC is applied to the switching circuit (Q408, Q409, Q412, and Q413). The operation of this switching circuit is controlled by the transformer T402 which is driven by the power control IC, IC520.
2. A low from pin 10 and a high from pin 15 of IC501 are used to turn on the power control IC (IC520) to energize the primary of transformer T402 and allow the switching circuit to drive transformer T404 (not shown in the diagram).
3. The secondary circuit of transformer T404 outputs the VSUS, VDA, and 15V voltage sources.



The 15V output from the secondary circuit of the power supply is applied to Q556.

In order to generate the FSTB14V, the F STB ON/OFF command (high) from pin 18 of IC501 is applied to the gate of Q524 to turn it on. Q524 outputs a low to turn on Q556. The transistor Q556 outputs the FSTB14V to pin 1, 2, and 3 of connector P10.

STB5V and TV-SUB-ON function on the PA PCB



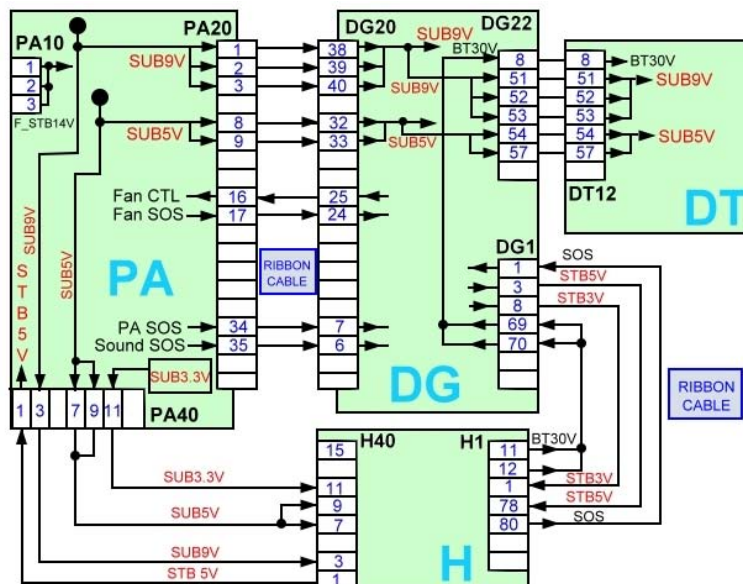
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The STB 5V at pin 1 of connector PA40 and the TV SUB ON command at pin 33 of connector PA20 are used to activate the PA SOS detect circuit on the PA board. This circuit monitors the following voltages for abnormality: FTSB14V, SUB3.3V, SUB9V, SUB5V, Main3.3V, and Main1.8V.

Under normal operation, the voltage from the voltage divider (R5694 and R5654) is enough to turn on Q5604. When Q5604 is on, a low is applied to the base of Q5643 turning it on. When Q5643 is on, 5V is applied to the collector and base of Q5641. The transistor remains off until a short circuit is developed in the supply lines connected to its base.

When Q5641 is off, a low is output to pin 34 of PA20. This low is then applied to pin 209 of IC1103 on the DG board through pin 7 of connector DG20.

SUB-Voltages Output From the PA Board



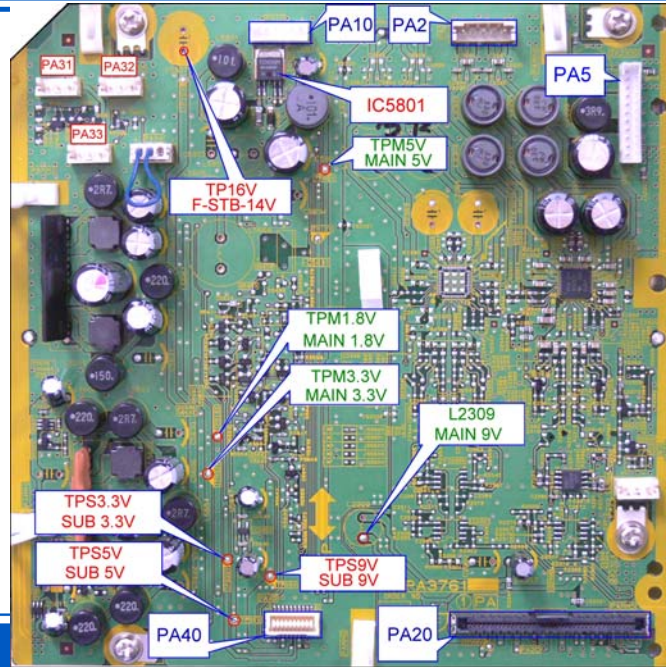
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When FSTB14V is applied to the PA board through PA10, immediately a set of voltages is developed, lasting only approximately 15 seconds after AC has been applied to the TV. These voltages are: SUB9V, SUB5V, and SUB3.3V.

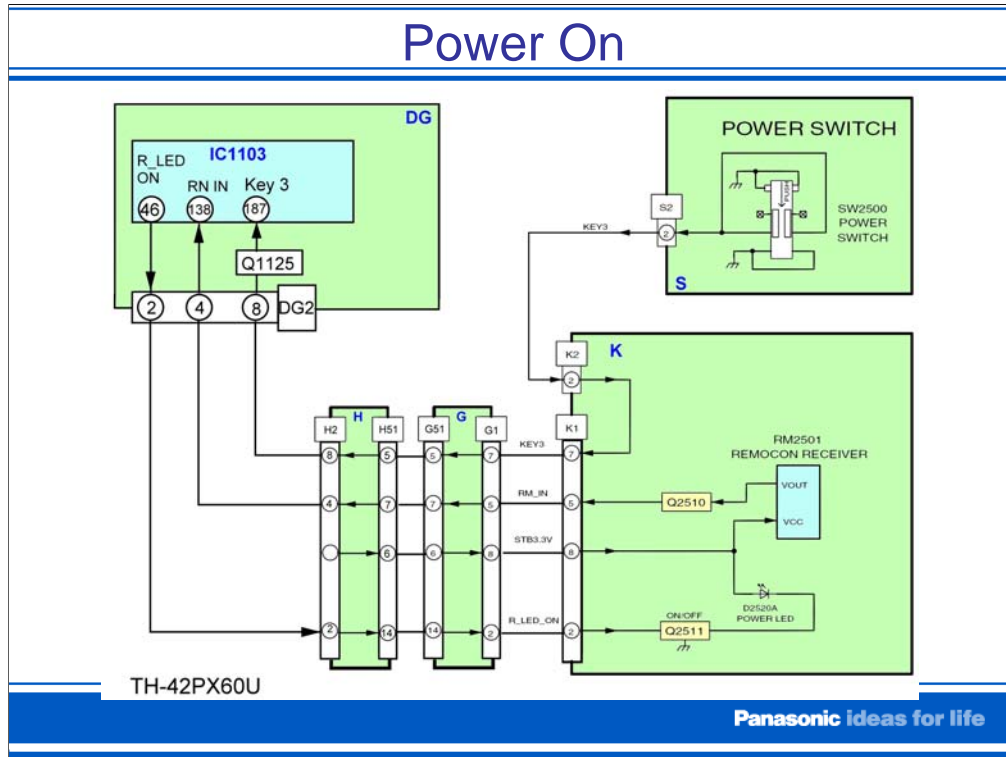
The SUB9V and the SUB5V are used by the DG board and the DT board. The H board also uses the SUB9V and the SUB5V, in addition to the SUB3.3V.

Unlike the previous models, the BT30V is developed in the H board instead of the PA board. The SUB9V is applied to a DC-DC converter that generates the BT30V on the H board. The BT30V is provided to the DT board through connectors DG1 and DG22 on the DG board.

PA Board Test Points

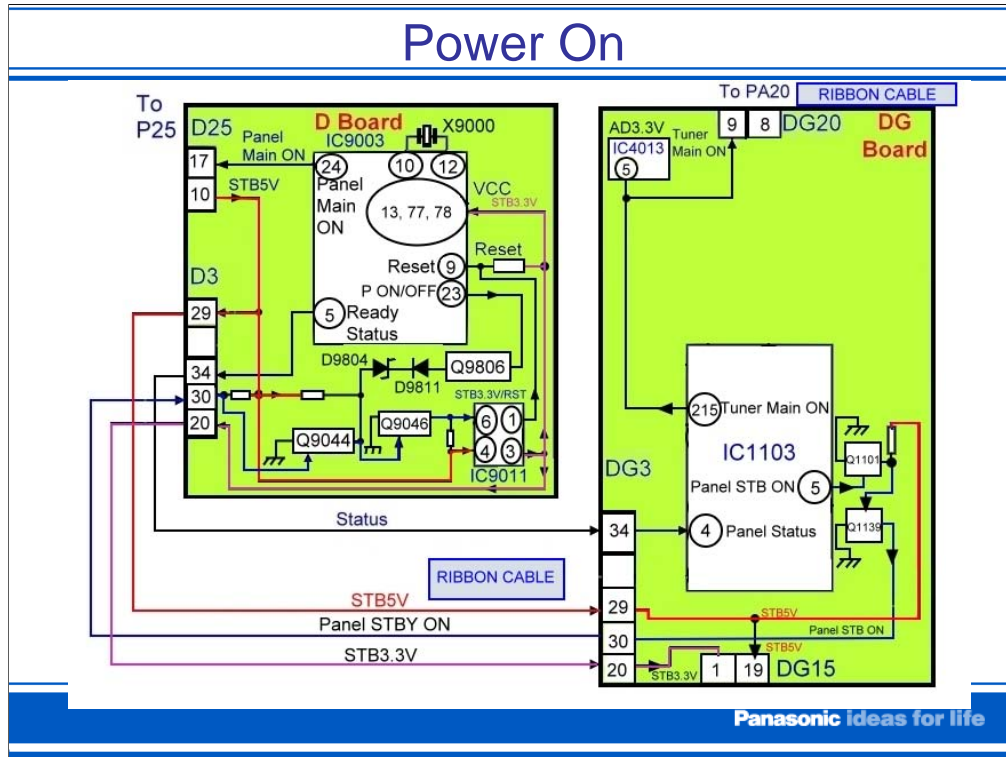


This picture shows the location of all the connectors and the test points on the PA board.



When the unit is turned on using the power button on the front of the TV, a low is applied to Q1125 to turn it on. Q1125 outputs a low to the key input line (pin 187) of the CPU IC1103 on the DG board.

The IR signal from the remote control is applied to pin 138 of IC1103 when the power is turned on using the remote control.



When the CPU on the DG board IC1103 receives the power on command from either the power switch on the TV panel or the remote control, both pin 5 and pin 215 go high (3.2V).

The 3.2V from pin 215 is provided to the PA board through connector DG20. It is used to turn on the circuit that generates the “MAIN” voltages on the PA board.

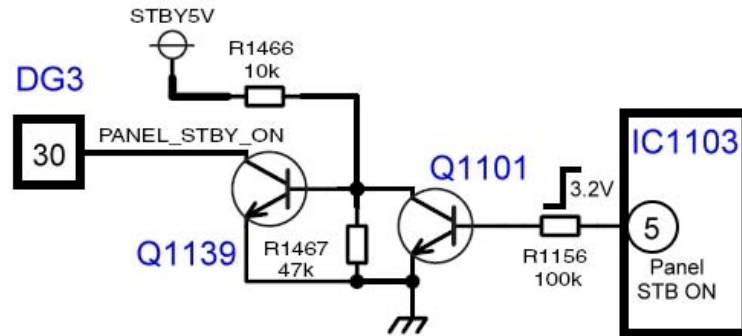
The 3.2V from pin 5 of IC1103 turns on Q1101. When Q1101 conducts, a low is applied to the base of Q1139 turning it off. When Q1139 is off, pin 30 of connector DG3 goes high (Pin 30 is kept high by a pull-up resistor connected to the STB5V on the D board).

The “PANEL STB ON” high from pin 30 of connector D3 is applied to the base of Q9044 on the D board, turning it on. Q9044 outputs a low to turn off Q9046 allowing pin 6 of the STB3.3V Regulator and Reset IC IC9011 to go high. When pin 6 goes high, IC9011 outputs the reset command at pin 1 and the STB3.3V at pin 3.

The STB3.3V is applied to the VCC pins of the CPU IC9003 (pins 13, 77, and 78). The CPU then outputs a high (3.2V) at pin 24. The 3.2V is directed to the power supply via pin 17 of connector D25/P25.

At the same time pin 5 (Ready – Status) of IC9003, also goes high (3.2). This voltage is used to provide the power status information of IC9003 to the CPU on the DG board IC1103. The “Ready – Status” enters pin 4 of the CPU via pin 34 of connector D3/DG3.

Panel-Standby-On Circuit



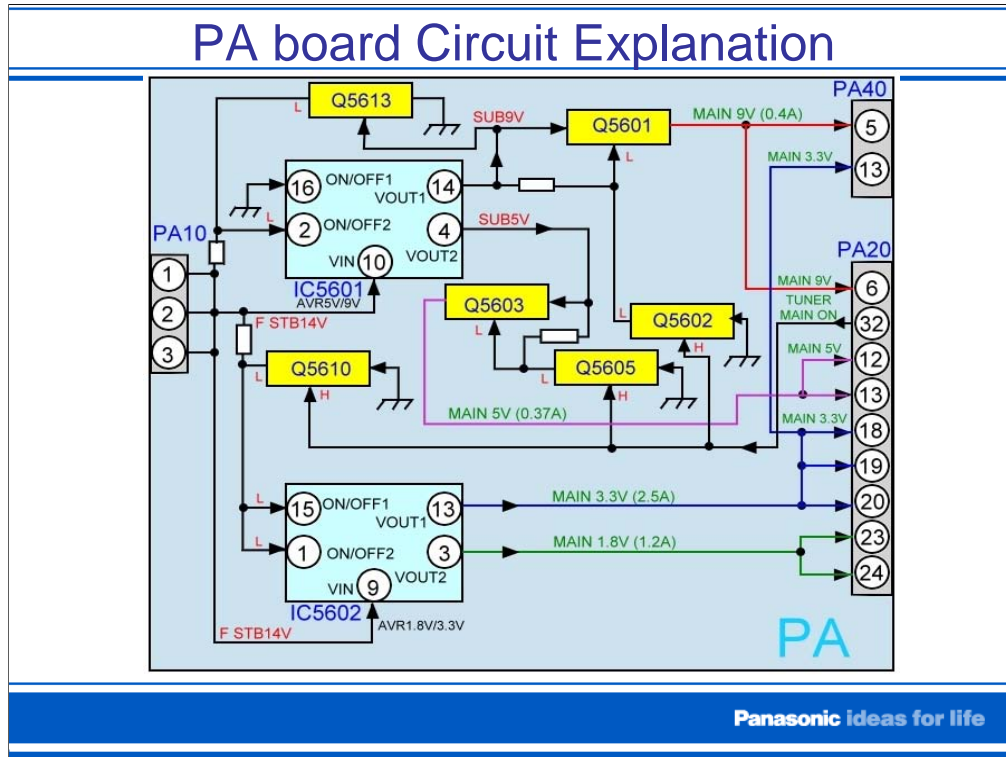
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When the TV is off, a low registered at pin 5 of IC1103 keeps Q1101 off. Consequently Q1139 conducts, keeping the voltage at pin 30 of connector DG3 low.

When the power is turned on, pin 5 of IC1103 goes high (3.2V) and Q1101 outputs a low to the base of Q1139 to turn it off. As a result, pin 30 of connector DG3 goes high. (Pin 30 is normally kept high by a pull-up resistor connected to the STB5V on the D board.)

[illegible]

The 5V is derived from the 15V line.



The “F-STB-14V” at connector PA10 is supplied to the voltage input pins of both regulators IC5601 and IC5602.

IC5601 is a dual voltage regulator. It generates 9V and 5V.

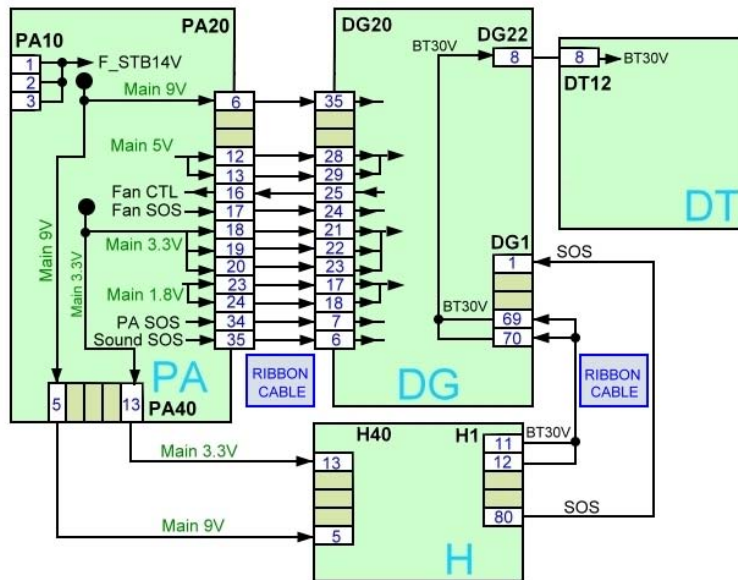
The SUB9V is output at pin 14 of IC5601 as soon as the STB14V is applied to pin 10. The ON/OFF pin (pin 16) is permanently grounded. The SUB9V is used to turn on Q5613 to provide a low to the second ON/OFF pin (pin 2), thus allowing the SUB5V to be output from pin 4.

When the power is turned on, the “TUNER MAIN ON” line from pin 32 of connector PA20, goes high (3.2V). This high is applied to Q5602 to turn it on. Q5602 outputs a low to turn on Q5601. When Q5601 is on, it outputs the “MAIN 9V” to pin 5 of connector PA40.

The “TUNER MAIN ON” voltage is also applied to the base of Q5605 to turn it on. Q5601 outputs a low to turn on Q5603. When Q5603 is on, it outputs the “MAIN 5V” to pins 12 and 13 of connector PA20.

Q5610 also turns on when the “TUNER MAIN ON” voltage is applied to it, outputting a low. This low is applied to both “ON/OFF” pins (15 and 1) of IC5602 allowing the “MAIN 3.3V” and the “MAIN 1.8V” to output at pins 13 and 3 respectively.

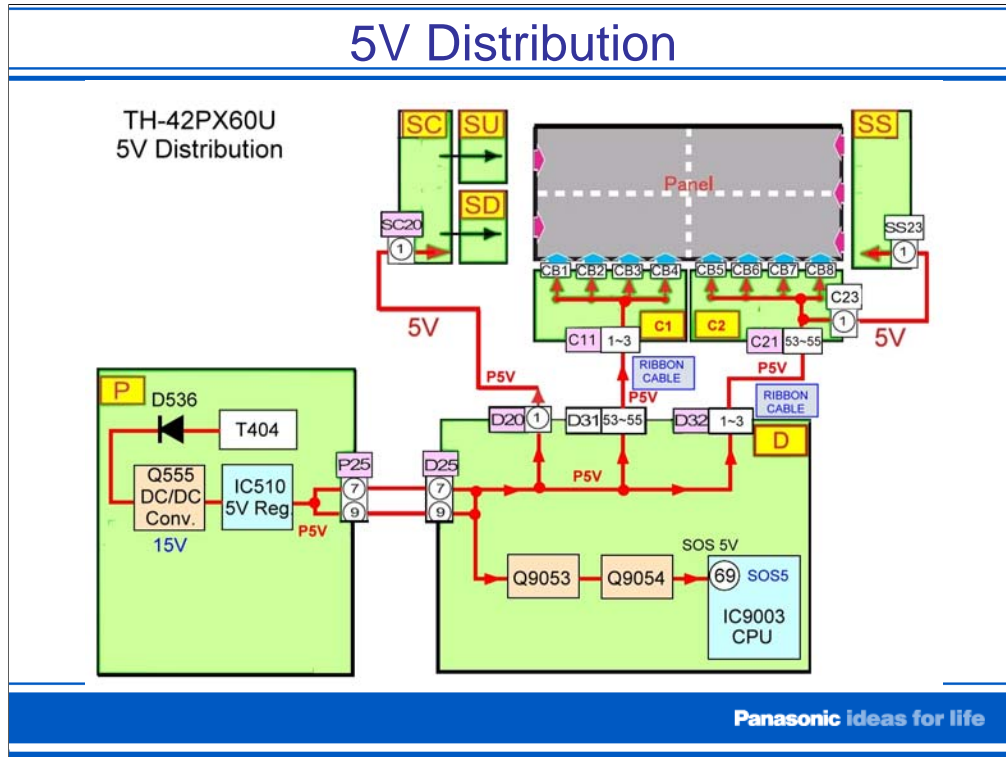
Main-Voltages Output From the PA Board



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When the power is turned on, a set of voltages, similar to the voltages developed when the unit was plugged in, is developed. These voltages are: Main9V, Main5V, Main3.3V, and Main1.8V.

All these voltages are used by different circuits in the DG board. The H board uses the Main9V and the Main3.3V.



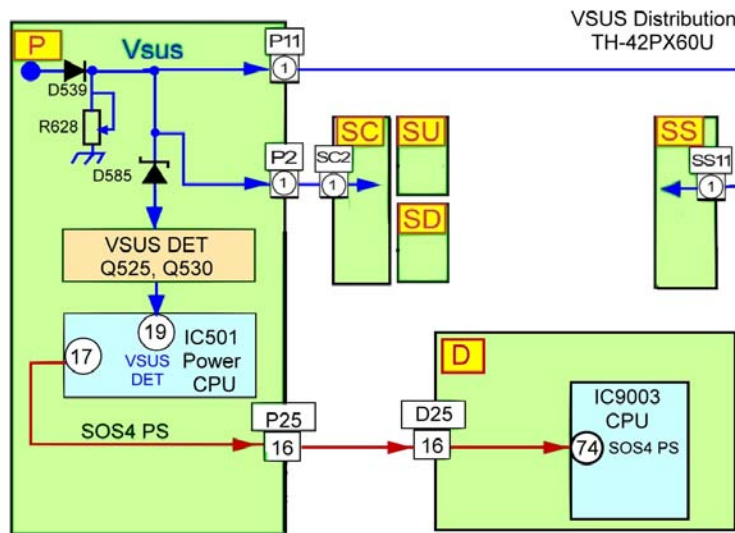
The switched 5V from the power supply board is applied first to the D board through connector D25. From there, the 5V is connected to the following boards:

1. The scan (SC) board through connector D20.
2. The data drive circuit board (C1) through connector D31.
3. The data drive circuit board (C2) through connector D32. From there the 5V goes to the sustain board through connector C23.

The 5V is monitored By Q9053 and Q9054 on the D board for short circuit. Normally the SOS5 pin (pin 69) of IC9003 is high. When the 5V is shorted, Q9053 is turned off allowing Q9054 to turn on and output a low to pin 69.

When pin 69 goes low, the TV shuts down and the power LED blinks 5 times.

VSUS Distribution

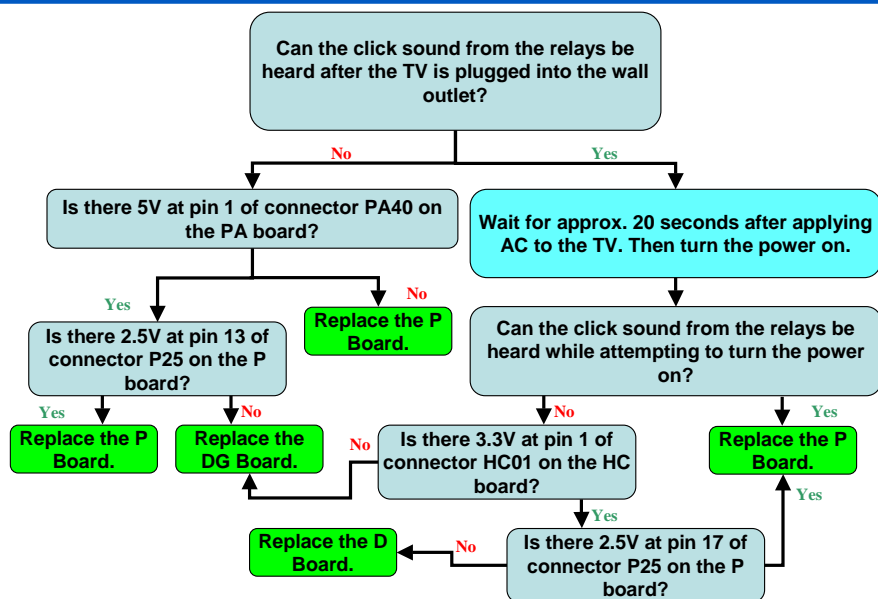


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The sustain voltage VSUS from the power supply board (P board) is provided to the SC board through pin 1 of connector P2/SC2. It is also provided to the SS board through pin 1 of connector SS11.

The zener diode D585 monitors the VSUS. If an over-voltage condition occurs, the VSUS detect circuit (Q525 and Q530) is triggered and a high is output to pin 19 of IC501. When pin 19 goes high, pin 17 also goes high to trigger the SOS4 line (pin 74 of IC9003) on the D board.

No Power Troubleshooting Chart



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Shutdown Detect Circuits

SOS

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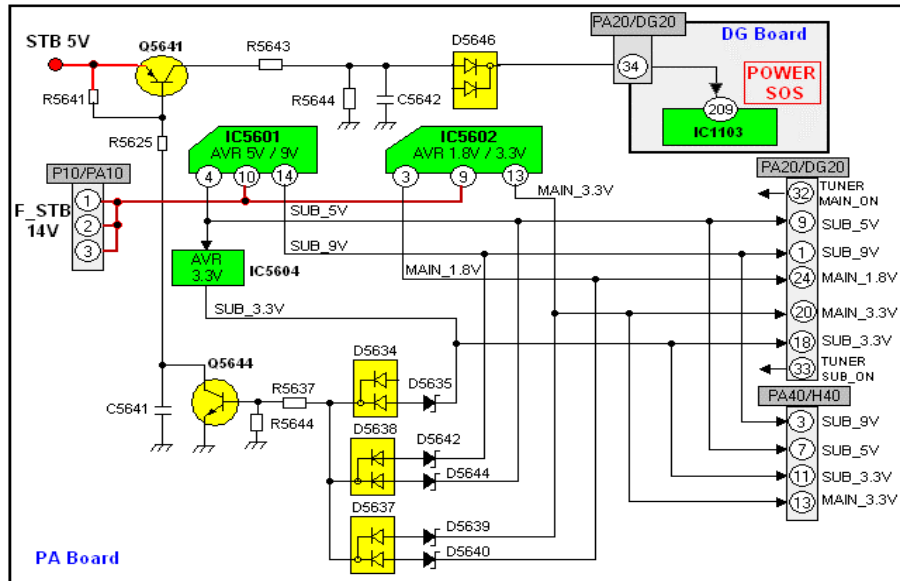
D Board SOS Detect

D Board SOS Detect		
SOS LINE	LINE MONITORED	NUMBER OF TIMES THE POWER LED BLINKS
SOS 2	15V	2 BLINKS
SOS 3	P3.3V (15V & STB5V)	3 BLINKS
SOS 4	PS	4 BLINKS
SOS 5	5V	5 BLINKS
SOS 6	SC1	6 BLINKS
DRVRST	5V DET	6 BLINKS
SOS 7	SC2	7 BLINKS
SOS 8	SS	8 BLINKS
SOS 9	CONF. DC LEVEL SHIFTER	9 BLINKS ?

DG Board SOS Detect

DG Board SOS Detect		
SOS LINE	LINE MONITORED	NUMBER OF TIMES THE POWER LED BLINKS
STB 3.3V DET	STB 3.3V	10 BLINKS
MAIN 3.3V DET	MAIN 3.3V	10 BLINKS
SUB 5V DET	SUB 5V	10 BLINKS
SUB 9V DET	SUB 9V	10 BLINKS
PA-TUNER SOS	PA & TUNER+30V	10 BLINKS
FAN SOS	FAN CIRCUIT	11BLINKS
SOUND	SOUND OUT CIRCUIT	12 BLINKS

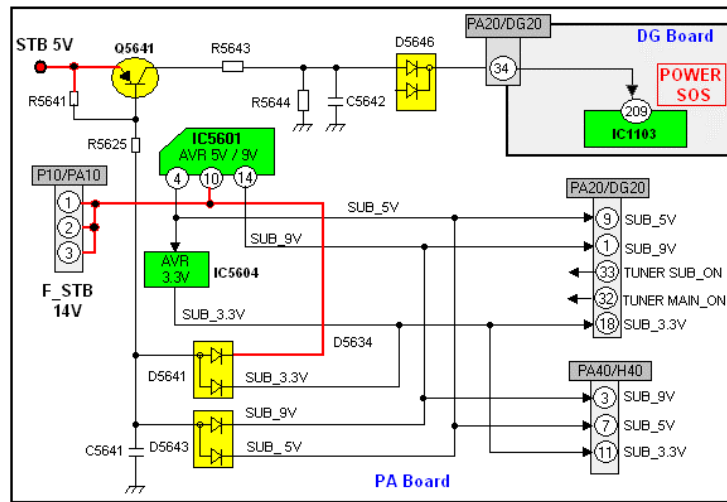
PA Board_Over-Voltage Protection



Panasonic ideas for life

The transistor Q5644 monitors the SUB5V, SUB9V, MAIN1.8V, MAIN3.3V, and SUB3.3V, lines. If any of these supply voltages becomes excessive, the inline zener diode goes into conduction and turns on transistor Q5644. As a result, a voltage drop appears at the base of Q5641, causing it to turn on and output a high to pin 209 of the MPU, IC1103, to trigger the SOS condition.

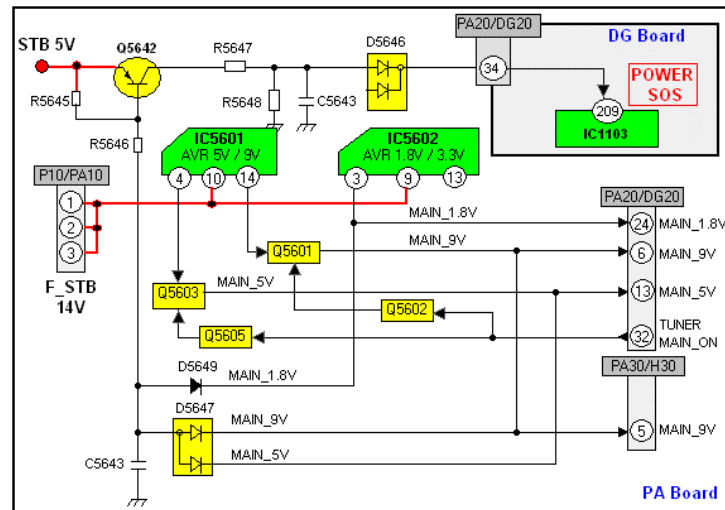
PA-Board_Loss of Sub-Voltage Protection



Panasonic ideas for life

The transistor Q5641 monitors the FSTB14V, SUB3.3V, SUB9V, and SUB5V lines. If any of these supply lines develop a short circuit, transistor Q5641 goes into conduction and applies a high to pin 209 of the MPU, IC1103, triggering an SOS condition.

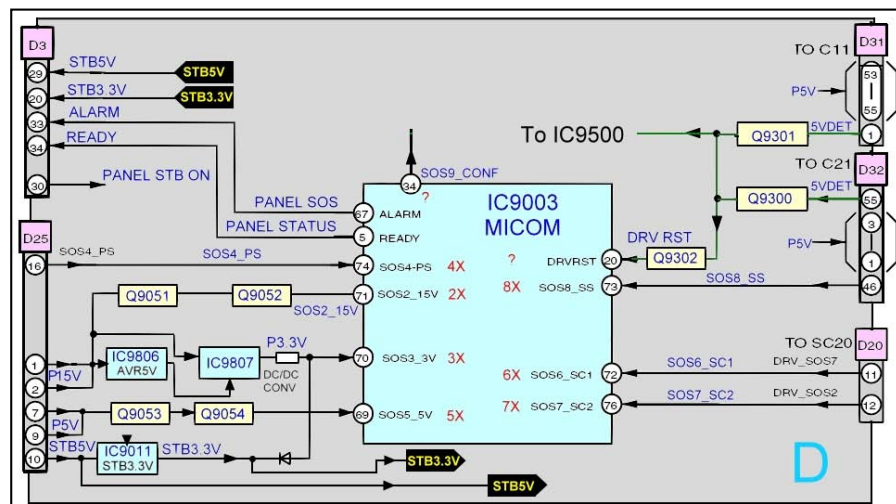
PA-Board_Loss of Main-Voltage Protection



Panasonic ideas for life

The transistor Q5642 monitors the MAIN1.8V, MAIN9V, and MAIN5V lines. If any of these supply lines develop a short circuit, transistor Q5642 goes into conduction and applies a high to pin 209 of the MPU, IC1103, triggering an SOS condition.

D Board SOS Detect

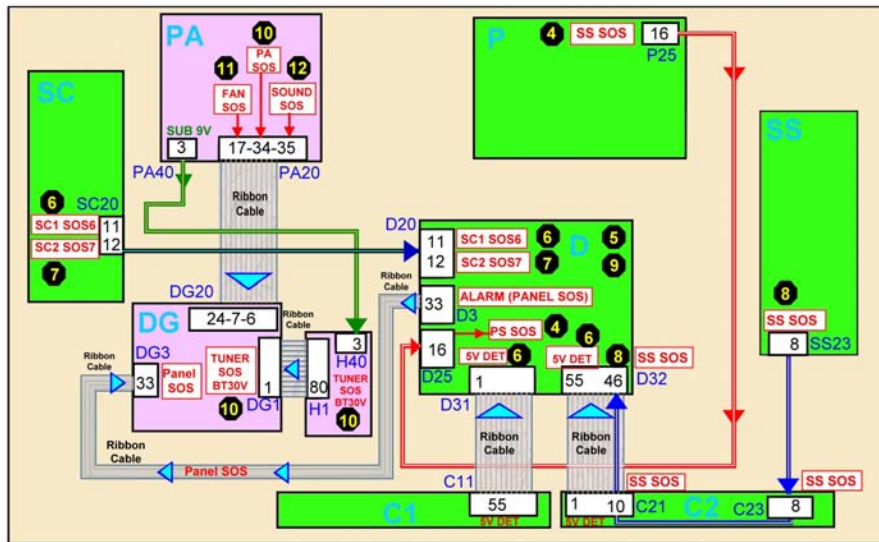


Panasonic ideas for life

Power supply abnormalities detected on the P board are reported to IC9003 via the SOS4 input. SOS2_15V, SOS3_3V and SOS5_5V of IC9003 monitor for a short circuit of the 15V, 3.3V and 5V inputs to the D board. The DRV_RST input monitors for the presence of 5V on the C boards. The remaining SOS inputs monitor for abnormal operation of the SC and SS boards.

Since the D board does not control the blinking pattern of the power LED, any detected SOS condition must be reported to the DG board MPU (IC1103). The alarm pin of IC9003 reports all SOS detections to the DG board MPU. The “ready” pin of IC9003 is an acknowledgement line that reports to the DG board MPU, the operational status of the D board.

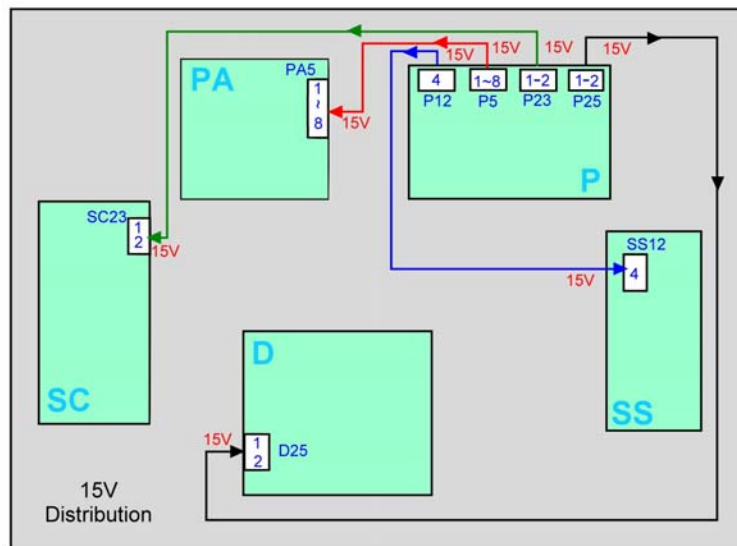
Origin of Power LED Blinks



Panasonic ideas for life

This drawing shows the relationship of most of the boards in the unit. It also shows the most likely board to replace when there is a shutdown condition and a blinking pattern emitted by the power LED.

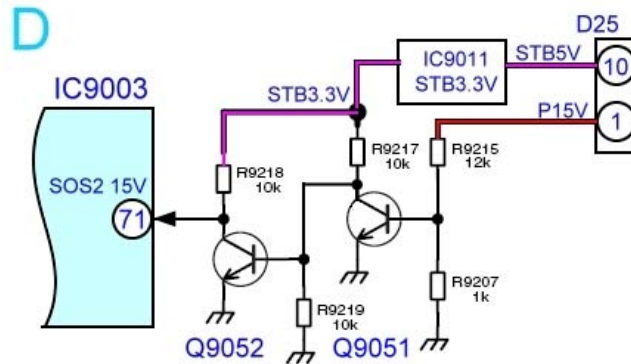
15V Distribution



Panasonic ideas for life

The 15V supply is created on the P board. It is distributed to the PA, SC, D, and SS boards.

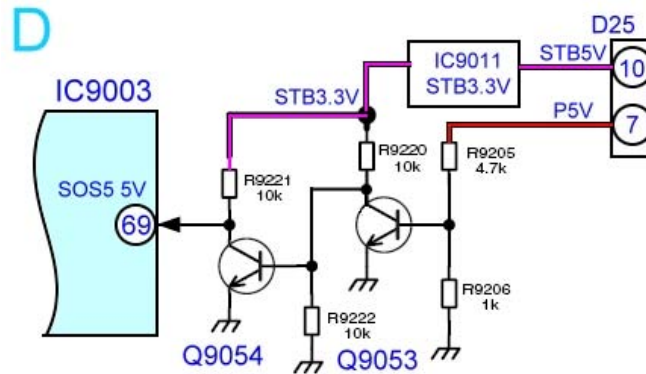
15V SOS



Panasonic ideas for life

During standby operation, pin 71 of the MPU (IC9003) is kept low by the transistor Q9052. Upon receiving the power-on command, the 15V source that originates at the power supply is applied to the voltage divider consisting of R9215 and R9207. The voltage drop causes the collector of Q9051 to go low and the collector of Q9052 to go high and indicate the presence of the 15V.

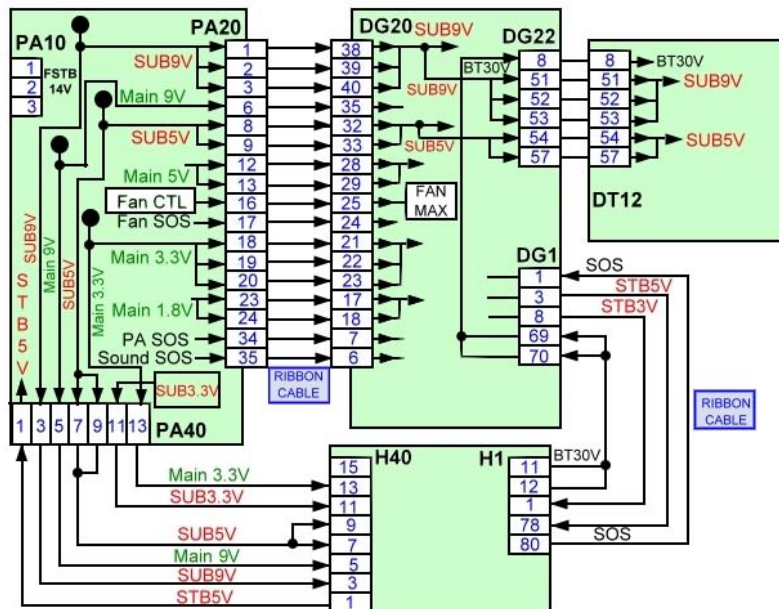
5V SOS



Panasonic ideas for life

During standby operation, pin 69 of the MPU (IC9003) is kept low by the transistor Q9054. Upon receiving the power-on command, the 5V source that originates at the power supply is applied to the voltage divider consisting of R9205 and R9206. The voltage drop causes the collector of Q9053 to go low and the collector of Q9054 to go high and indicate the presence of the 5V.

PA Voltage Output

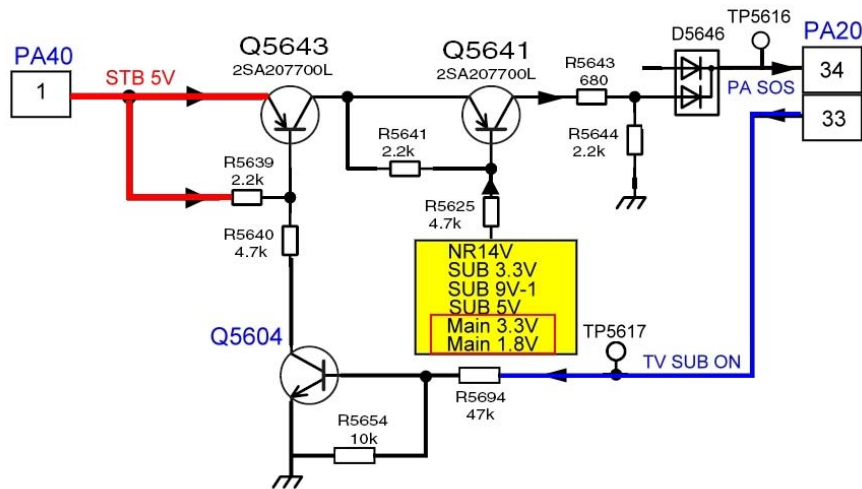


Panasonic ideas for life

This diagram depicts the distribution of the PA board voltages to the DG, H, and DT boards. A high output at pin 34 of connector PA20 will cause the unit to shut down and generate ten blinks of the power LED. This SOS condition is created when there is an abnormality of any of the voltages shown in the diagram.

A high output at pin 35 of connector PA20 causes the unit to shut down and generate twelve blinks of the power LED. This SOS condition is created when there is an abnormality in the audio amplifier circuit or its 15V source.

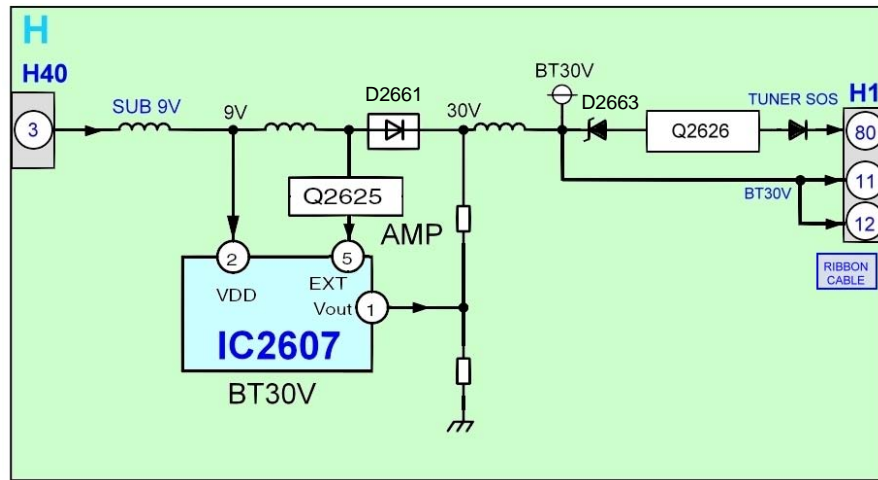
PA SOS Detect Circuit



Panasonic ideas for life

Upon connecting the television to the wall outlet, the STB 5V created by the P board is applied to the PA board via pin 1 of connector PA40. The TV SUB ON command of the DG board MPU (IC1103) enters pin 33 of connector PA20 and turns on Q5604. As a result, Q5643 turns on allowing the STB 5V to the biasing circuit of the transistor Q5641. The transistor Q5641 remains off until one of the voltages connected to R5625 becomes shorted.

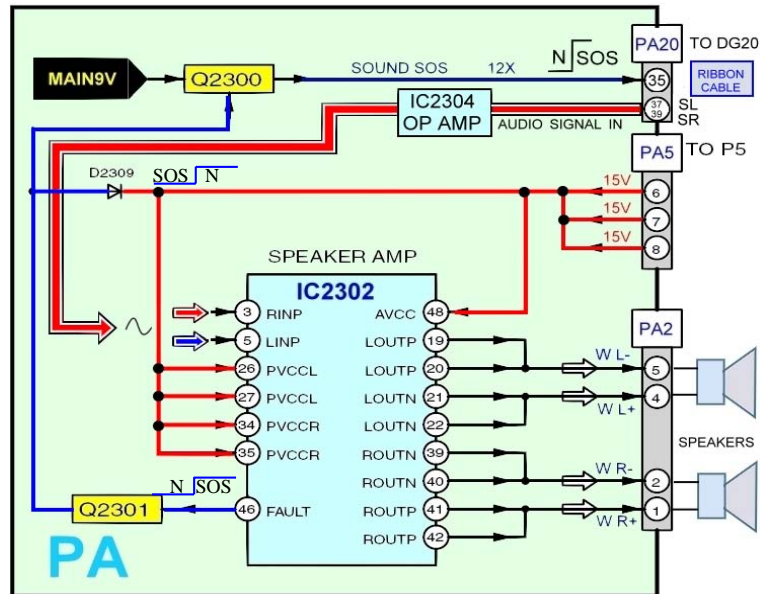
BT30V (Tuner SOS) Detect Circuit



Panasonic ideas for life

The BT30V source is generated by a boost regulator circuit that consists of IC2607 and biasing components. The BT30V output is monitored for over-voltage condition. The diode D2663 goes into conduction when its reverse breakdown voltage is exceeded. The output of the diode causes Q2626 to turn on and output a high to trigger the SOS condition.

Sound SOS Detect Circuit

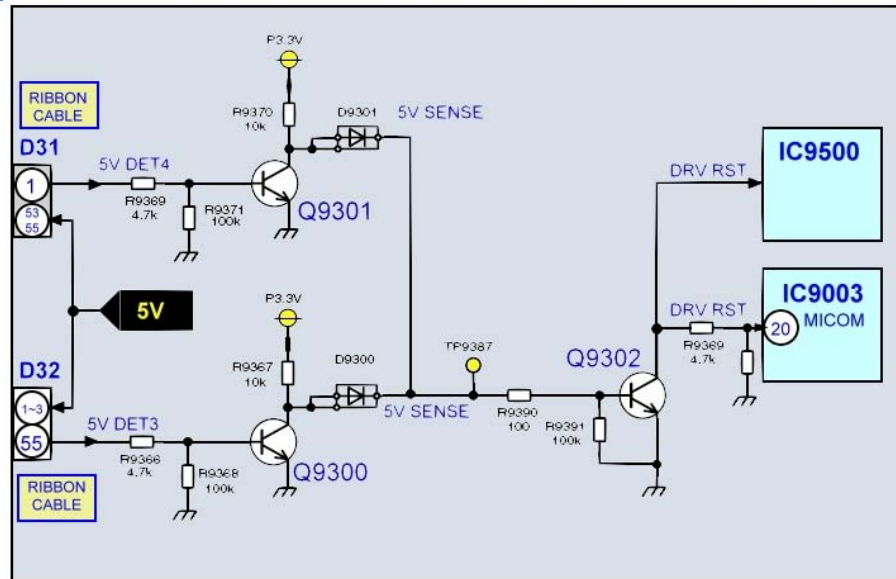


Panasonic ideas for life

The transistor Q2301 monitors the speaker amplifier IC (IC2302). If the IC or one of the speakers develops a short circuit, a high is output at pin 46 of the IC causing Q2301 to go into conduction and output a low to the base of Q2300. As a result, Q2300 comes on and outputs a high to the DG board.

A short circuit of the 15V line causes the diode D2309 to go into conduction. The base voltage of Q2300 becomes low and a high is output to the DG board.

Drive Reset Circuit



Panasonic ideas for life

DRV RST input to IC9500 and IC9003 must be high for the unit to operate. The D board provides the 5V source needed to power the C boards. On the C board, the 5V is routed back to the D board to activate the 5V SENSE circuit. A voltage divider consisting of R9369 and R9371 causes the collector of transistor Q9301 to become low. As a result, the base voltage of Q9302 also becomes low causing its collector to become high. The output voltage is applied to IC9500 and IC9003 as DVR RST.

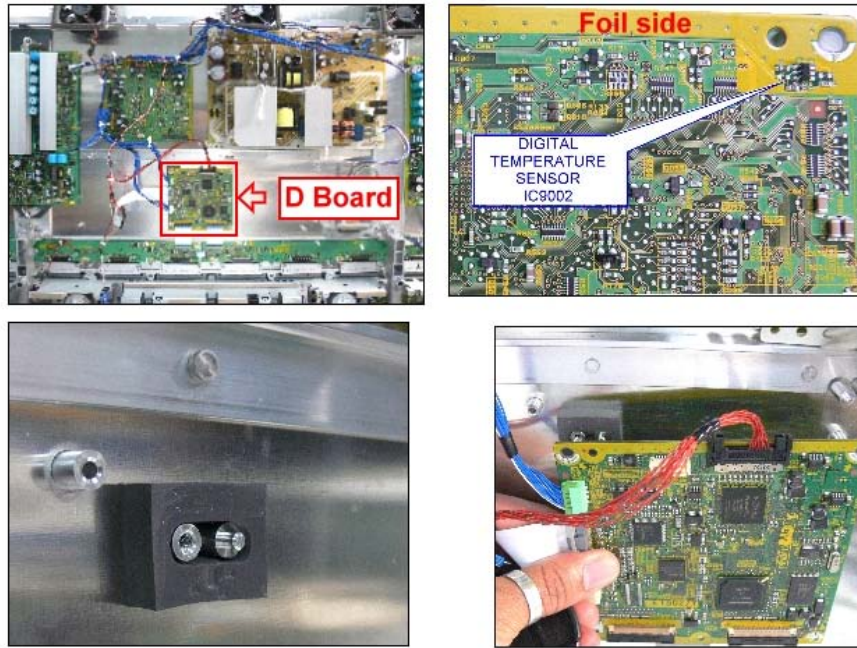
The operation of the 5V SENSE circuit of the C2 board is the same.

The diodes D9301 and D9302 are used to isolate the two 5V SENSE circuits.

When the 5V SENSE circuit does not detect 5V from any of the C boards, the DVR RST output becomes low. The unit goes into shutdown and the power LED blinks 6 times.

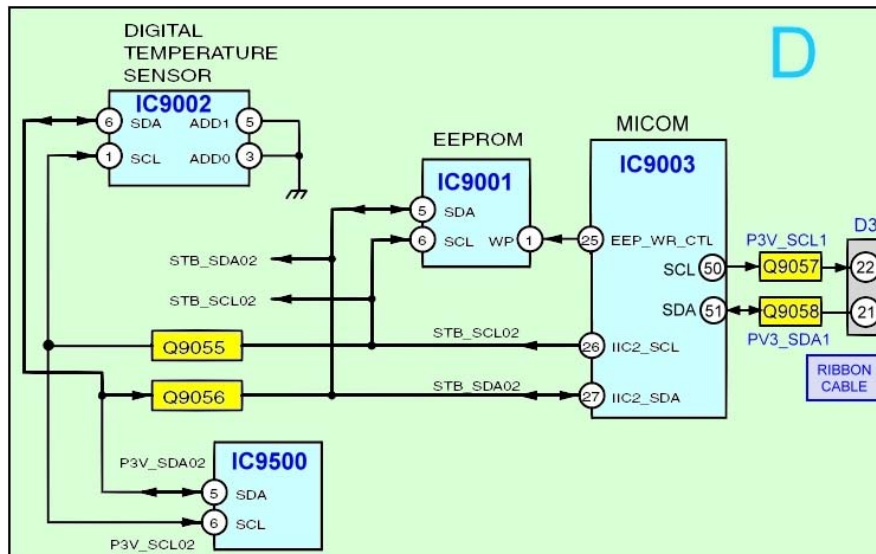
Test Point TP9387 is the ideal location to check for DRV RST.

Digital Temperature Sensor



This slide shows the location of the D board and the digital temperature sensor.

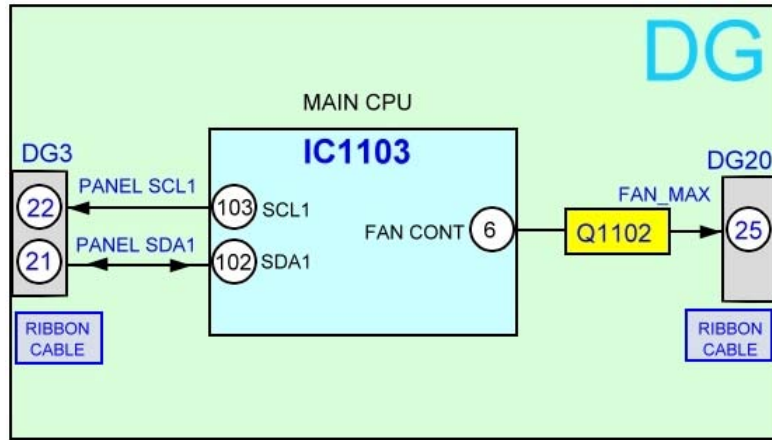
Digital Temperature Sensor



Panasonic ideas for life

The internal temperature of the unit is monitored by the digital temperature sensor (IC9002). Variations in temperature are sensed by the IC and reported to the D board MPU (IC9003) via the SDA02 bus line. IC9003 then conveys the information to the DG board MPU (IC1103) via the SDA1 bus line. Fan speed is controlled by IC9003.

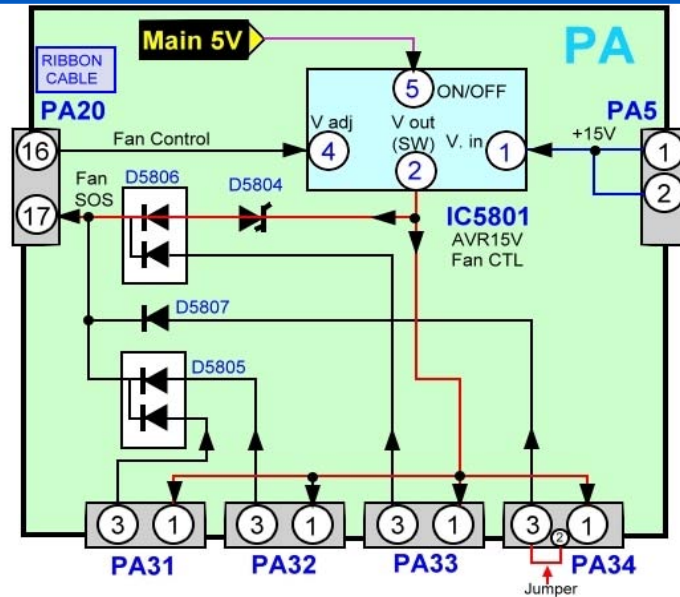
Digital Temperature Sensor (Continued)



Panasonic ideas for life

The command “FAN_MAX” that controls the speed of the fans is a PWM signal whose duty cycle is determined by the internal temperature of the unit. The temperature is monitored by a digital temperature sensor mounted on the D board. Changes in temperature are reported to DG board MPU (IC1103) via the IIC bus line.

Fan SOS



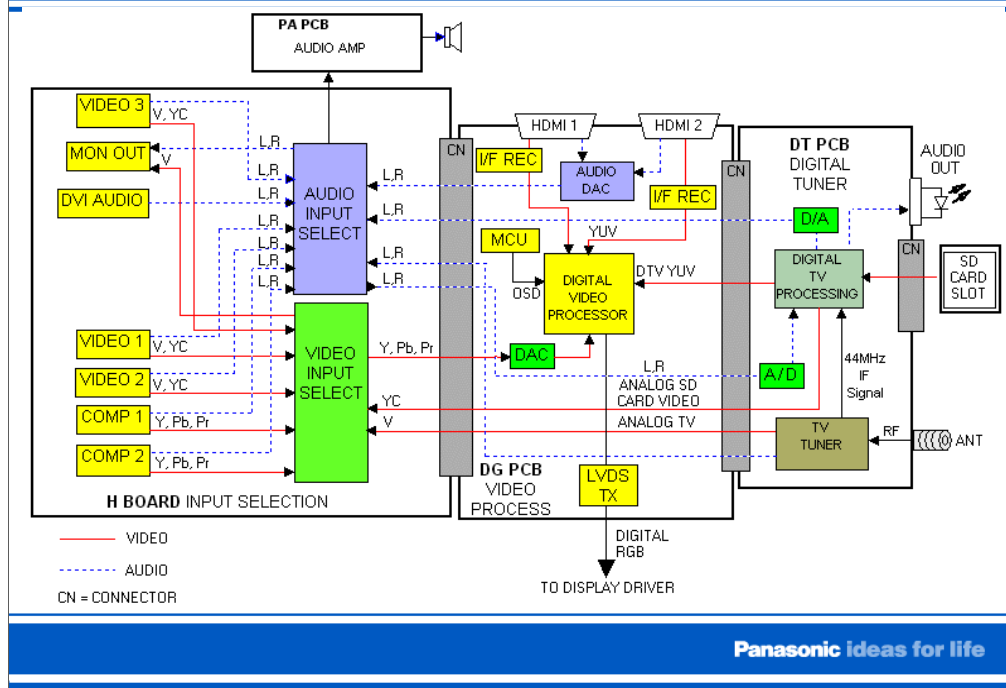
Panasonic ideas for life

The PA board contains the fan drive circuit. To control the speed of the fan, a PWM signal that originates in the DG board Microprocessor(IC1103) is applied to pin 4 of IC5801. The duty cycle of the PWM signal is varied according to the internal temperature of the unit. The result is different levels of DC voltage being applied to the fans to keep the unit cool.

If the supply voltage at pin 2 of IC5801 becomes excessive, the inline zener diode (D5804) goes into conduction and forward biases the diode D5806. As a result, a High is output at pin 17 of connector PA20 to trigger the SOS condition.

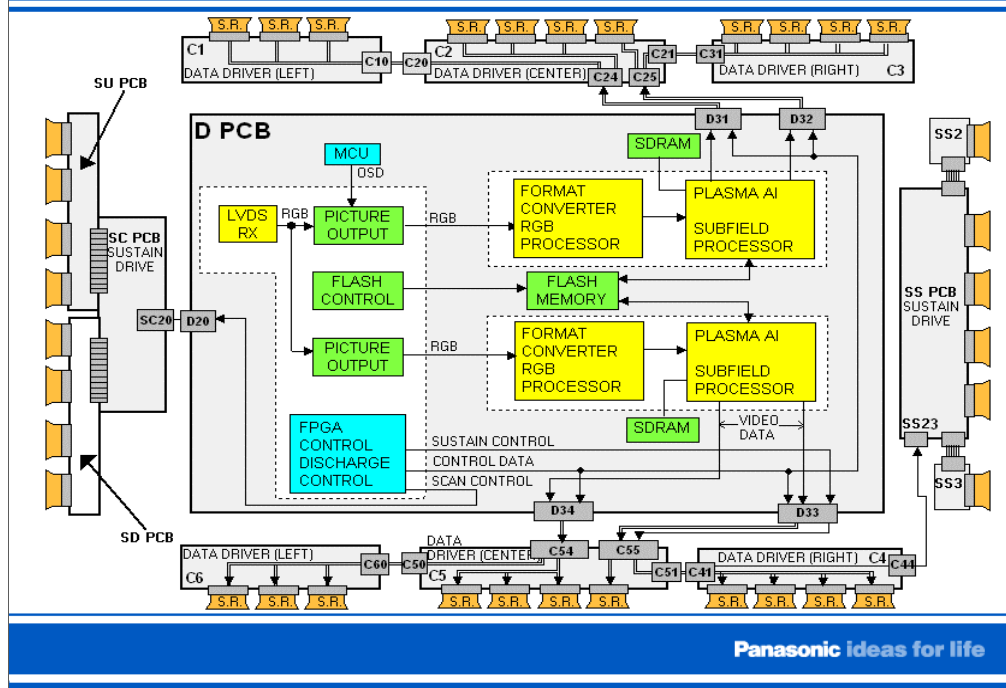
If any of the fans becomes defective, A high is output at pin 3 of the fan connector to forward bias the inline diode. The DC output of the diode is provided to pin 17 of connector PA20 to trigger the SOS condition.

42PX60 Audio/Video Process



1. GP9DU Chassis plasma televisions incorporate a Set Top Box that is designed to receive NTSC and ATSC television broadcast. It is also used to receive QAM cable television transmission. It is a hybrid tuner that processes NTSC and ATSC terrestrial broadcast for reproduction on the TV screen.
2. The DT-Board in the TH-42PX600 and TH-50PX600 also incorporates the OpenCable interface for use with a CableCard. This tuner allows the reception of Digital Cable television without the use of a set-top-box.
3. The tuner of all GP9DU models also processes the JPEG data of the SD card used for viewing pictures. Photo-viewer data from the GS board is input to the DT board and converted to analog luminance and chrominance signals. Analog Television and Photo-viewer signals are output to the H board and selected like any other source. Digital television signals (Y, U, V) are output to the DG board for video selection and processing.
4. The GK board, not shown in this drawing, is the operation board of the unit. The key scan pulses are routed to the DG board MPU via the G and H boards.
5. The G board of the TH-42PX600 and TH-50PX600 contains the third video input which is provided to the H board for selection among many other video inputs.
6. The K board contains the Remote IR sensor and the power LED.
7. The unit also contains two other video inputs, and two component inputs that are directly connected to the main switch of the H board. The H board selects and outputs, to the DG board, the video signal for display on the screen.
8. The DG board is responsible for the complete video processing within the unit. All analog inputs to the DG board are immediately converted to digital. All signal processing in the DG board is performed digitally. Signals from a digital TV source is provided directly to the DG board in digital form.
9. The HDMI inputs jacks are now mounted on the DG board. The HDMI IF receiver converts the digital signal into parallel Y, U, V data which is processed on the DG board.
10. The board performs PIP (Picture in Picture) and picture control operations such as brightness, contrast, color, tint, etc. The output signal of the board passes through an LVDS (Low Voltage Differential Signaling) transmitter for conversion into serial data. The PEAKS firmware of the unit also resides in this board.

50PX60 Panel Drive



The D board is responsible for displaying the picture on the screen. It provides the scan, sustain and data drive signals. The scan pulses are output to the SC board. The sustain pulses are output to the SS board. The data drive signals are output to the C1, C2, C3, C4, C5 and C6 boards. The C1, C2 and C3 boards buffer the data drive signals that are applied to the upper half of the panel; The C4, C5 and C6 boards buffer the data drive signals that are applied to the lower half of the panel.

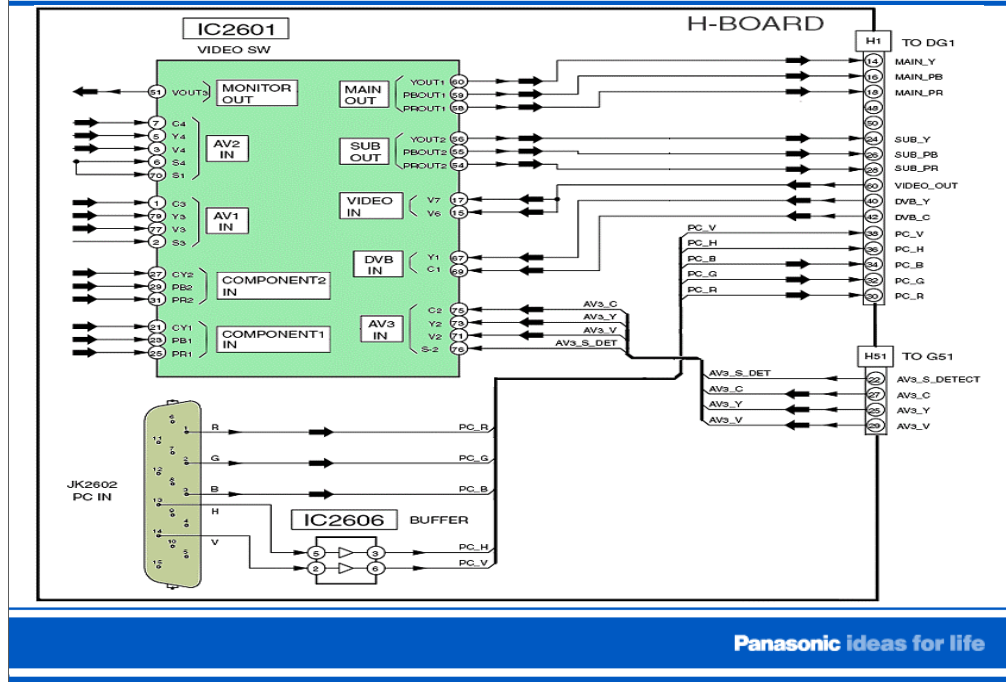
The SC board is responsible for the generation of the scan pulses. Scan pulses are used for initialization and selection of the pixels.

The SU and SD boards are de-multiplexer boards that are responsible for converting serial data output of the SC board into parallel data to drive the panel.

The SS board is responsible for the generation of the sustain pulses. Sustain pulses are used to initialize and control the brightness of the screen.

The SS2 and SS3 boards are extension (connector) boards used to connect the SC board to the panel.

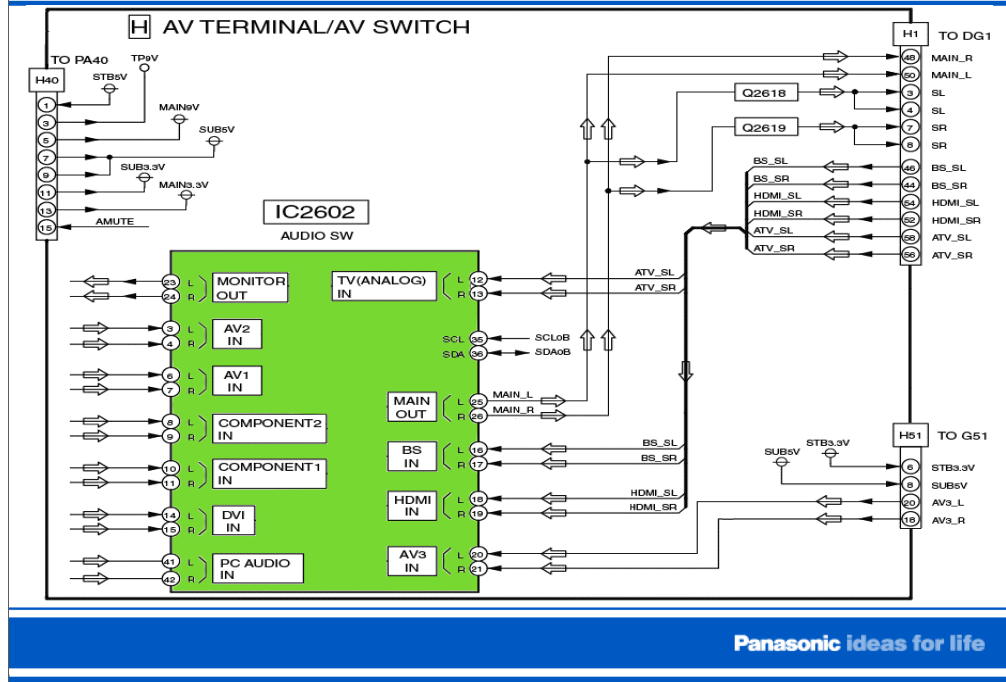
50PX60 Video Input



The H board contains the Video inputs 1, 2, and 3, Component Video Inputs 1 and 2, and the Program Out jacks. All the Audio/Video input signals are applied to this board for selection. There are two input selection ICs on this board; IC2601, which selects the video input signals and IC2602, which selects the audio input signals. Composite video, luminance and chrominance signals from the digital tuner pass through the DG board and enter IC2601 of the H board via the connector H1/DG1. The selected video signals are output to the DG Board without alteration. The output signals can be in any of the three formats; Video, Y/C, or Y, Pb, Pr.

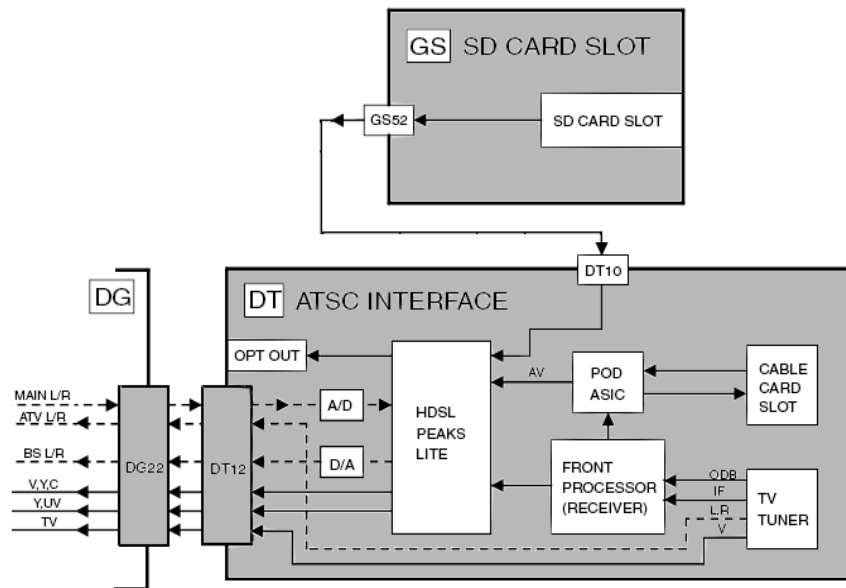
The PC input signal simply passes through the H board and enter the DG board via the same connector. Selection between PC and other input signals takes place on the DG board.

50PX60 Audio Input



IC2602 of the H board handles the audio selection of all inputs. Audio signals from the digital tuner and the HDMI receiver board (DV board) pass through the DG board and enter IC2602 of the H board via the connector H1/DG1. The selected audio signals are output to the DG Board without alteration. The audio output at pins 48 and 50 of the connector H1/DG1 passes through the DG board and enters the DT Board for conversion into PCM (Pulse Code Modulation) audio. Pins 3 and 7 of connector H1/DG1 provide the audio output that is routed to the PA board for processing and output to the speakers.

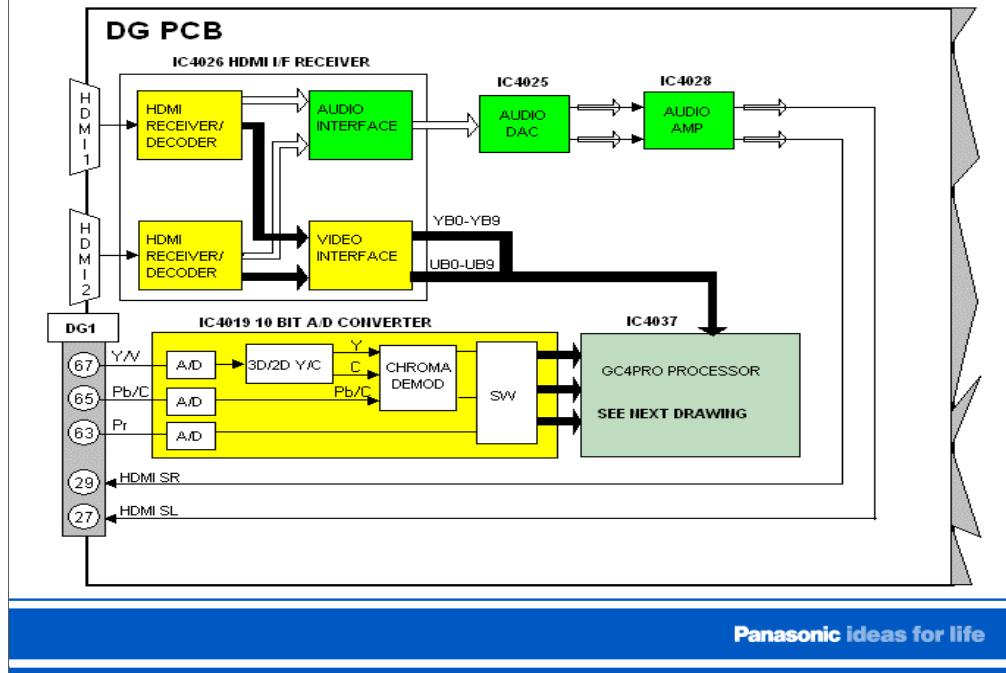
50PX60 Digital Tuner



Panasonic ideas for life

1. The ATSC interface (DT board) processes the ATSC, NTSC, and QAM television signals. It also processes the Photo viewer (JPEG) data of the SD card. The composite, luminance and chrominance, or component video signals of the DT board are output to the DG board via the connector DT12/DG22.
2. The DT-Board in the TH-42PX600 and TH-50PX600 also incorporates the OpenCable interface for use with a CableCard. This tuner allows the reception of Digital Cable television without the use of a set-top-box.
3. The DT board contains an Optical Audio Out jack for use with a Dolby Digital decoder and a multi-channel amplifier. When a digital channel is selected, the output from the Digital Audio Out jack is Dolby Digital. The same jack outputs PCM (Pulse Code Modulation) when any other signal source is selected.
4. An SD card slot is also included in the DT board. As the OpenCable service changes, the firmware information located in the DT board may be upgraded by using an SD card.
5. The DT board contains the host identification number and stores the identification number of the CableCard. Remember that only the TH-42PX600 and TH-50PX600 contain a CableCard Slot. All other 2006 models do not contain this slot. All cable digital channels that are received will not be mapped according to the cable operator's program guide. The channels will be displayed according to their radio frequency allocation.
6. The tuner of all GP9DU models, with the exception of the TH-42PD60, also processes the JPEG data of the SD card used for viewing pictures. Photo-viewer data from the GS board is input to the DT board and converted to analog luminance and chrominance signals. Analog Television and Photo-viewer signals are output to the H board and selected like any other source. Digital television signals (Y, U, V) are output to the DG board for video selection and processing.

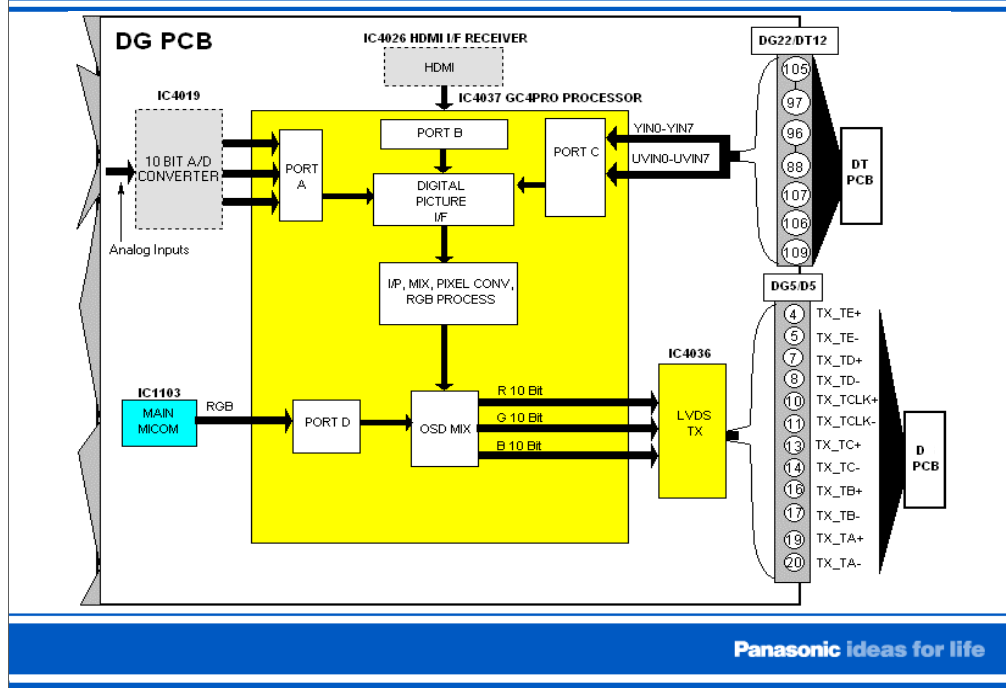
50PX60 Video Process



Panasonic ideas for life

1. The unit contains two HDMI inputs jacks that are mounted on the DG board. The HDMI IF receivers convert the digital signal into parallel Y, U, V data and output to the video interface circuit for selection. The selected HDMI data is output to IC3047 for selection among the other inputs. The selected signal is then processed by IC3047.
2. Pins 63, 65, and 67 of connector H1/DG1 provide the selected video output signals of the H board to the DG board. On the DG- Board, the main Y/V, Pb/C, Pr signals are converted to digital data by the analog to digital (A/D) converter circuits located inside the Global Core IC, IC4019.
3. The comb filter in IC4019 converts the composite video signal of the main picture to Y and C (luminance and chrominance) separated video signals. S-Video, which is already Y/C separated, simply passes through the comb filter. The chrominance data is then applied to the Chroma demodulator circuit that separates the color signal into Pb and Pr data. At the completion of this process, the composite or S-Video signal is now in the form of a digital 480i component signal. If the incoming video is in the 480p, 720P and 1080i format, the Y, Pb, and Pr signals are converted to digital only. The output of IC4019 the is provided to the RGB processor (GC4PRO).
4. The HDMI audio signal is processed in a similar way as the video. The HDMI IF receivers convert the HDMI audio into digital stereo data and output to the audio interface circuit for selection. The selected digital audio is output to IC4025 for conversion into analog. It is then amplified by IC4028 and output to the H board for selection among the other audio inputs.

50PX60 Video Process (2)

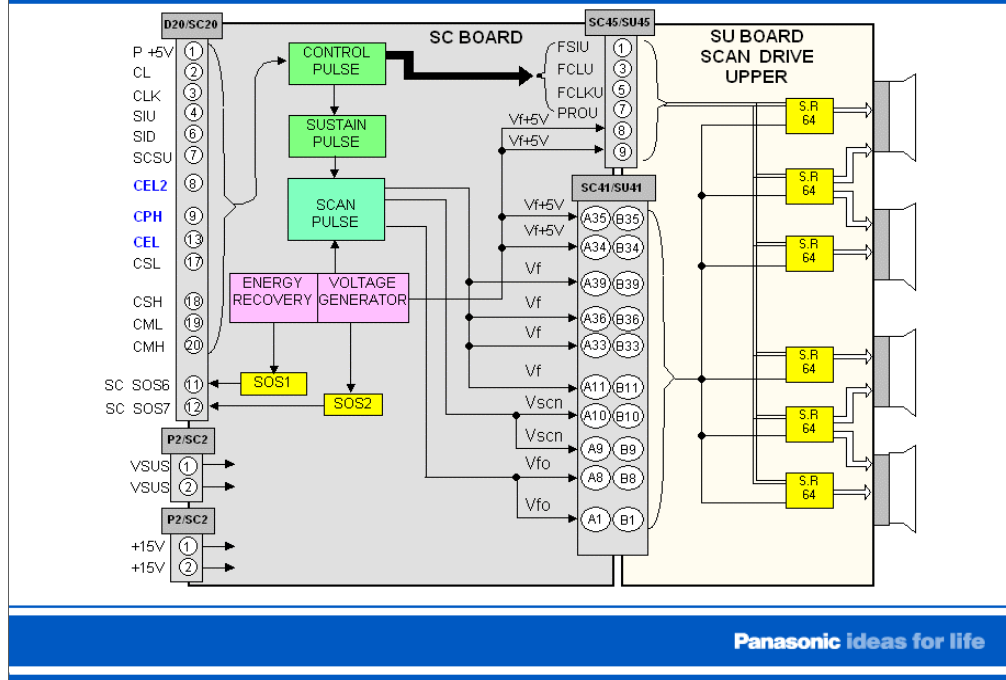


The digital TV and HDMI data are input directly to this integrated circuit. By avoiding digital to analog and analog to digital conversion of those signals, the picture information remains in its original structure. As a result picture quality is pure, and free from noise.

The data output of IC4019 enters the RGB Processor, IC4037. The Digital Picture Interface selects the desired video signal from all the sources and output to the I/P, MIX, PIXEL CONV, and RGB PROCESS circuit. Within this portion of the IC, the 480i video signal undergoes interlace to progressive conversion. IC4037 contains a line doubling circuit that halves the horizontal line period of the 480i input, doubling the horizontal frequency to 31.468KHz. The signals that are of the 480P, 720P and 1080i formats simply pass through the IP converter. On Screen Display data of the MPU; such as audio and picture adjustments are mixed with the video data. This circuit performs all picture control operations such as brightness, contrast, color, tint, etc. The output signal is then applied to the LVDS (Low Voltage Differential Signaling) transmitter for conversion into serial data. The LVDS transmitter transfers the video information from the DG board to the D board. It distributes signals with low-jitter, while creating little noise. It reduces power consumption and the generated noise from data transmission. Another benefit of the LVDS standard is minimal concern for cable length.

The main MCU handles all video applications. It serves as the controller that monitors all operations of the unit.

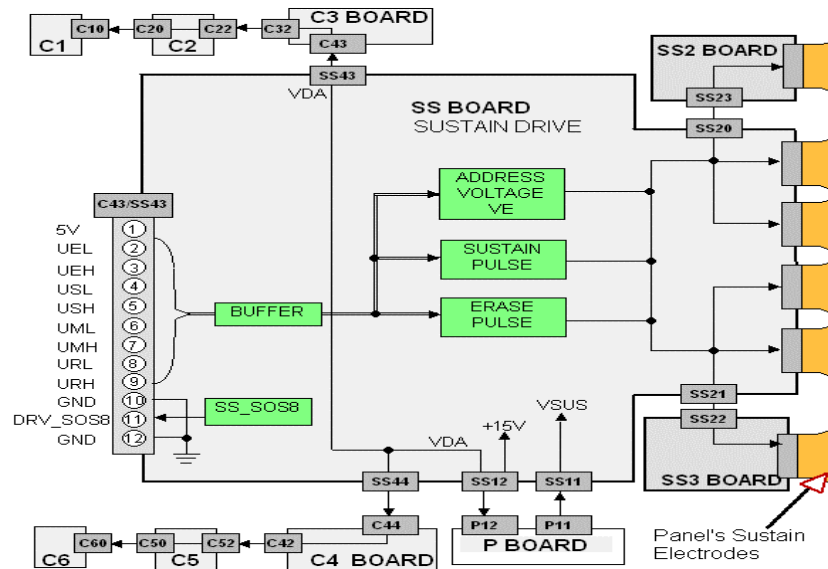
50PX60 Scan Operation



The SC Board consists of buffers and drivers used to generate the scan signals for the PDP panel. The buffers provide isolation between the D board and the drivers. the drive voltages as well as to switch the FET transistors. Connector SC20 provides the the trigger signals from the D board to switch the FETs on and off to create the distinctive scan signal. Each trigger signal switches a drive FET creating a portion of the waveform.

After the scan waveform is developed on the SC Board, it is applied to the SU and SD boards for de-multiplexing. The signal is input to a series of shift registers that handle the de-multiplexing operation. There are six driver ICs on the SU board and six on the SD board.

50PX60 Sustain Operation

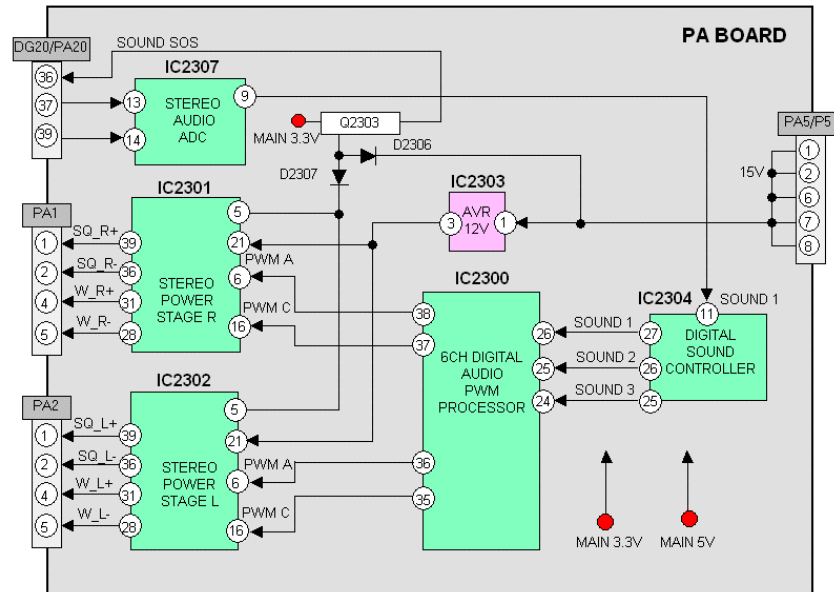


Panasonic ideas for life

After the video signal is processed on the D board, the sustain and erase pulses are output to the SS board. The erase pulse is output at the beginning of each scan period. The pulse is applied to the SS2 and SS3 boards to remove the previous charge from the the display panel.

The sustain pulses are also developed on the D board and are applied after the address periods.

50PX60 Audio Circuit



Panasonic ideas for life

1. A new digital audio circuit is now incorporated in the GP9DU chassis. Analog audio signals from the H board travel through the DG board and enter the PA board. IC2307 performs analog to digital conversion of the audio signal and outputs to the digital audio controller, IC2304. Sound processing and adjustments are performed within the IC to provide a 3 bit parallel output to the 6 Channel Audio PWM Processor, IC2300. Within IC2300, the 3 bit parallel audio signal is converted into 2 channels PWM audio and applied to the audio power amplifiers IC2301 and IC2302. The PWM signals of the power amplifiers are output to the right and left channel speakers for sound reproduction.
2. IC2303 converts the 15V source to 12V for connection to the audio power amplifiers.
3. The diode D2307 and transistor Q2303 monitor pin 5 of the power amplifiers for excessive current drain. If a short circuit develops, transistor Q2303 goes into conduction and outputs a high to pin 36 of the connector DG20/PA20, triggering an SOS condition.
4. A short circuit of the 15V line causes the diode D2306 to go into conduction. As a result, the base voltage of Q2300 becomes low and a high is output to the DG board to trigger an SOS condition.

Self-Check and Reset Procedure

CHASSIS: GP9D and GPH9D

MODELS: TH-42PD60, TH-**PX60, TH-**PX600

Self-check Screen

How to access the self-check screen

Select a television channel, and while pressing the [VOLUME (-)] button on the main unit, press the [OK] button on the remote control for more than 3 seconds.

How to Exit the self-check screen

Disconnect the AC cord from the wall outlet.

SELF	CHECK	TZ1-00600 -00500			
UV	OK	DT1	OK	DT2	OK
SND	OK	AVSWV	OK	AVSWA	OK
ADV	OK	GC5	OK	HDMI	OK
MEM	OK	RTC	OK	PANEL	OK
SOS : 1		345	789	BC	
ROMCORR CHECKSUM : 25					
DT ERROR INCH37P42					
Copyright 2005 Matsusita					
Electric Industrial Co.,Ltd					

Panasonic ideas for life

Diagnostic Procedures

Self-check is used to automatically check the status of the ICs that are controlled via the IIC bus line. Under normal condition, the status is **OK**. A status indication other than OK indicates a problem within a specific board

How to access the Self-check Screen (Reset)

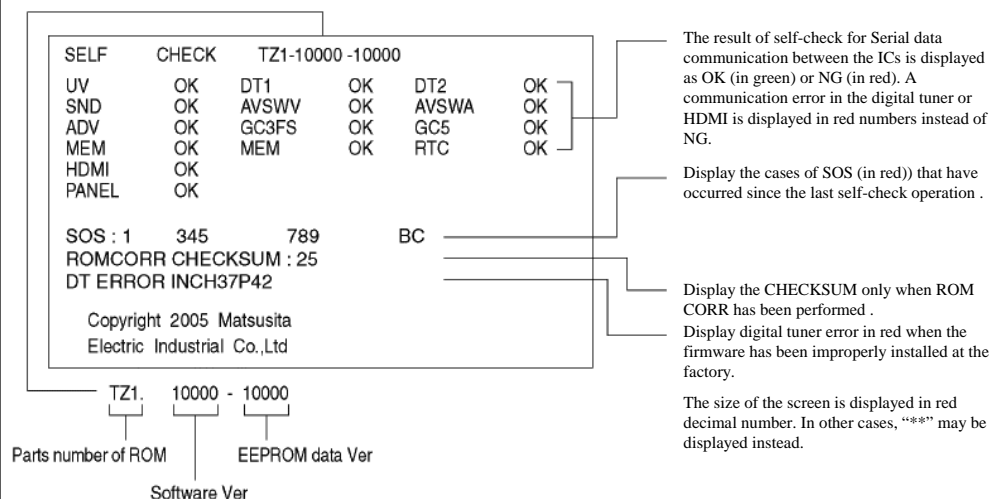
To get into the Self-check mode, select a television channel then press and hold down the **VOLUME DOWN** button on the front of the unit, and the **OK** button on the remote control. Hold them down for at least three seconds. The unit self tunes to channel 3. The word "SELF-CHECK" appears at the center of the screen for a few seconds, and then a graphic OSD appears.

How to Exit the self-check screen

Disconnect the AC cord from the wall outlet.

Note: All Customer settings (parameters) including CableCard activation data will be erased. If the customer uses a CableCard, re-activation will be required after the reset.

Interpretation of the Self-Check Screen



Panasonic ideas for life

9th Generation Self-Check Screen

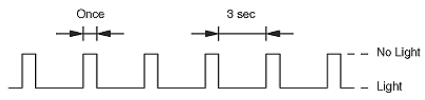





Check the following boards if NG is displayed in the self-check screen.

Display	Ref.No.	Description	Board
UV	TU8200	TV Tuner	DT-Board
DT1	IC8211	Front Processor	DT-Board
DT2	IC8240	HDMSL PEAKS_Lite	DT-Board
SND	IC2603	Sound Processor	H-Board
AVSWV	IC2601	Video SW	H-Board
AVSWA	IC2602	Audio SW	H-Board
ADV	IC4019	10Bits A/D	DG-Board
GC3FS	IC4020	GP3FS	DG-Board
GC5	IC4037	GC5 Processor	DG-Board
HDMI	IC4026	HDMI I/F Reciever	DG-Board
MEM	IC1102	EEPROM	DG-Board
RTC	-	Real Time Clock	-
PANEL	IC9003	MICOM	D-Board

Panasonic ideas for life

Check the following boards if NG is displayed in the self-check screen.







Power LED Blinking timing chart (1)

Blinking Times	Blinking timing	Contents	Check point
1		No particular check point	-
2		15V SOS	D-Board
3		3.3V SOS	D-Board
4		Power SOS	P-Board
5		5V SOS	D-Board
6		Driver SOS1 (SC Energy recovery circuit)	SU-Board SD-Board SC-Board

Panasonic ideas for life

The unit is equipped with a self-protection circuit that places it in standby when there is an abnormality with one or more circuits. The faulty circuit may be easily identified by counting the number of flashes emitted by the power LED located in front of the unit.

Power LED Blinking timing chart (2)

Blinking Times	Blinking timing	Contents	Check point
7		Driver SOS2 (SC floating voltage area)	SU-Board SD-Board SS-Board
8		Driver SOS3 (SS Energy recovery circuit)	SS-Board
9		Panel Status	-
10		PA SOS Tuner SOS	PA-Board H-Board
11		Fan SOS	Fan
12		Sound SOS	PA-Board

Panasonic ideas for life

The unit is equipped with a self-protection circuit that places it in standby when there is an abnormality with one or more circuits. The faulty circuit may be easily identified by counting the number of flashes emitted by the power LED located in front of the unit.

Serviceman Mode

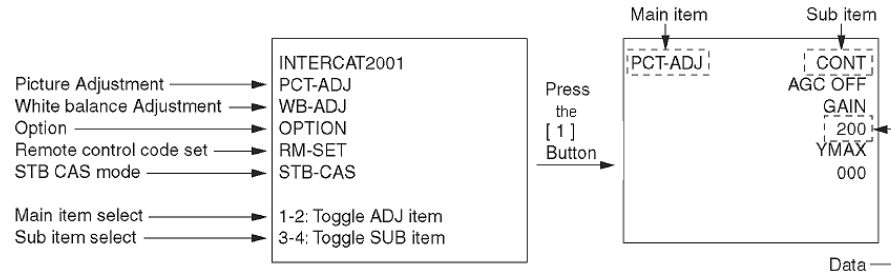
While pressing the **[VOLUME DOWN]** button of the main unit, press the **[RECALL]** button of the remote control three times in a row (within 2 seconds).

Adjustment method

Use the remote control to navigate through the adjustment menu.

- # [1] Button to select the Main items in forward direction
- # [2] Button to select the Main items in reverse direction
- # [3] Button to select the Sub items in forward direction
- # [4] Button to select the Sub items in reverse direction

Use the **[VOLUME UP]** and **[VOLUME DOWN]** buttons of the remote control to change the value of the Sub Items.



Cancellation

To exit the serviceman mode, switch off the power by pressing the **[POWER]** button of the main unit.

Panasonic ideas for life

Of all the items listed in the serviceman mode menu, there should only be three that are of interest to you.

1. Picture Adjustment = Picture quality; such as Sub-brightness, Color, Tint, etc.
2. White balance adjustment = Red Cut Off, Blue Cut Off, Blue Drive, Green Drive, etc.
3. Option = The internal pattern generator can be accessed by selecting this item.

Contents of adjustment menu

Note: After entering the adjustment mode, write down the value of each Sub item before making any adjustment.

Use the (VOLUME UP) and (VOLUME DOWN) buttons of the R/C to change the value of the Sub Items.

Cancellation

To exit the serviceman mode, switch off the power by pressing the [POWER] button of the main unit.

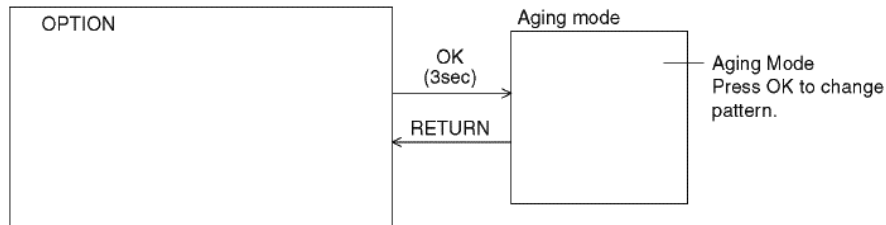
Main item	Sub item	Sample Data
PCT-ADJ	CONT	GAIN 200
	COLOR	38
	TINT	05
	BRIGHT	7FB
	RFAGC1	74
	AGCADJ1	FIX
	RFAGC2	74
	AGCADJ2	FIX
WB-ADJ	R CUT	80
	G CUT	80
	B CUT	80
	R DRV	EC
	G DRV	FC
	B DRV	DB
	ALL CUT	80
	ALL DRV	FC
	WB BRG	804
	SD BOOT	ROM
OPTION	OPT00	01
	ANT-POW	OFF
	POF-SET	NORMAL
	STB-SEC	SEC
	EMGCY	OFF
	EEP COPY	ALL
	CLK MODE	00
	CLOCK	80
	CEC-CHK	OFF
	RM-SET	CODE
STB-CAS	-	-

Panasonic ideas for life

The hexadecimal values should always be copied on paper prior to performing any of the adjustments. There may be occasions when an adjustment may make things worse than they were prior to changing the hexadecimal value. If one should encounter a problem of this type, revert to the copied value to undo any harm that may have been done.

Internal Pattern Generator (Aging Mode)

To access the internal pattern generator, select [**OPTION**] from the main adjustment item and press the [**OK**] button of the remote control for three seconds. Press the **OK** button to navigate through the different patterns.



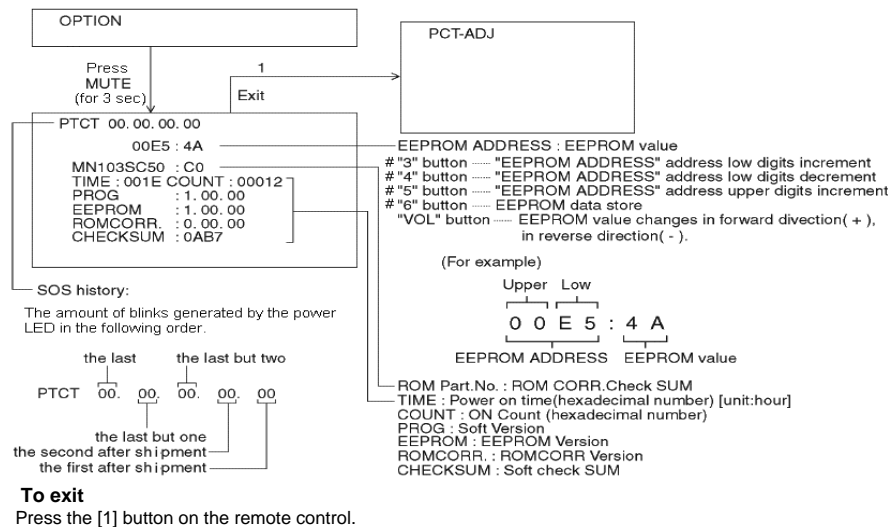
To exit the internal pattern generator, press the [**RETURN**] button of the remote control.

Panasonic ideas for life

The internal pattern generator can be helpful in determining whether a display problem originates in the video process circuit or the panel drive circuits. If the picture distortion is visible when the pattern generator is used, it is almost certain the problem is in the panel drive circuits. If the distortion is no longer visible, it is almost certain that the problem is in the video process circuit. Do not ever discount the possibility of a power supply problem.

How to access the memory edit mode

1. Select "OPTION" in the Serviceman Mode menu.
2. Press the [MUTE] button on the remote control for more than 3 seconds.



Panasonic ideas for life

The memory edit feature is not a required adjustment. The only adjustment that may be of interest to a technician is the Time and Count function. It may be required that the Time and Count of the unit be reset to zero after the replacement of the plasma display panel.

Time = the cumulative number of hours the unit has operated for.

Count = the number of time the unit has been activated on and off.

How to access the Device data mode

1. Select the memory edit mode.
2. Press the **[RECALL]** button on the remote control.

WECOR	0	IWEC	0
SD-CASE	2	ISD	0
MV-SYS	0	IVFREQ	7FF
IHCKNUM	7FF	IHCKNUM2	7FF
IFNSD	0		
IVNSD	1	IHNSD	1
CKNUM-BS	368	VFREQ-BS	36E
CKNUM-HD	7FF	VFREQ-HD	7FF

To exit

Press the **[Recall]** button on the remote control.

Panasonic ideas for life

Memory edit should never be performed unless directed by Panasonic. Although it is listed in the service manual, changing the hexadecimal values may result in the undesirable operation of the unit.

Driver Setup Adjustment

Driver Set-up

Item / Preparation

1. Input a white signal to one of the unit's video input.
2. Set the picture controls as follows:
Picture menu: Vivid
Picture: +30
Aspect: Full

Caution

1. Perform the Vsus adjustment.
2. Confirm the voltage level of VSCN. This should be done after the adjustment of Vad which should be -105V
Note: The confirmation of Vscn voltage should be performed after the adjustment of the Vad voltage.
When Vad = -105V, Vscn voltage is 35V \pm 4V.

Name	Test Point	Voltage	Volume	Remarks
Vsus	TPVSUS (SS)	Vsus \pm 2V	R628 (P)	*
Ve	TPVE (SS)	Ve \pm 2V	VR6000 (SS)	*
Vset	TPVSET (SC)	260V \pm 7V	Fixed	
Vad	TPVAD (SC)	-105V \pm 1V	VR6600 (SC)	
Vscn	TPVSCN (SC)	Vad+140V \pm 4V	Fixed	
Vda	TPVDA (SS)	75V \pm 1V	Fixed	
Vdat	P12-1, 5 (P)	75.5V \pm 0.1V	R665 (P)	
PFC	C446 (+)(-)	396V \pm 0.5V	R443 (P)	
Vlow	C555 (+)(-)	78.5V \pm 0.1V	R661 (P)	Vda load current : 0.4A
Csus	TPVSUS (SS)	180V \pm 0.5V	R671 (P)	Vsus load current : 1.57A

Panel Label information



Panasonic ideas for life

Driver setup adjustment is mandatory after replacing the SC, SS, and P boards. It is also required after the replacement of the panel. These are some of the symptoms you may obtain if the adjustment is not performed.

1. Several images may be displayed at the same time
2. Excessive brightness
3. Low brightness
4. Wrong color
5. Reduction of the life span of the panel

The voltage level of VE and VSUS is not listed in the service manual. Refer to the panel label for the voltage level.

Initialization Pulse Adjustment

Initialization Pulse Adjustment

1. Input a 100% White signal to the unit.

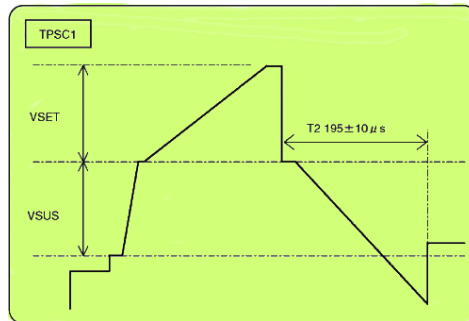
2. Set the picture controls as follows:

Picture menu : Vivid

Picture : +25

Aspect : Full

3. Connect an Oscilloscope to test point TPSC1. Using VR6602, adjust (T2) for $195 \pm 10 \mu\text{s}$.



Panasonic ideas for life

The initialization pulse adjustment is mandatory after replacing the SC, P, and SS board. It is required after replacing the plasma display panel. If misadjusted, several images may be displayed on the screen at the same time. Follow the instructions displayed on the slide to perform the adjustment.

Panasonic Services Company

Thank you!
Good day!

Not in the book

Panasonic ideas for life